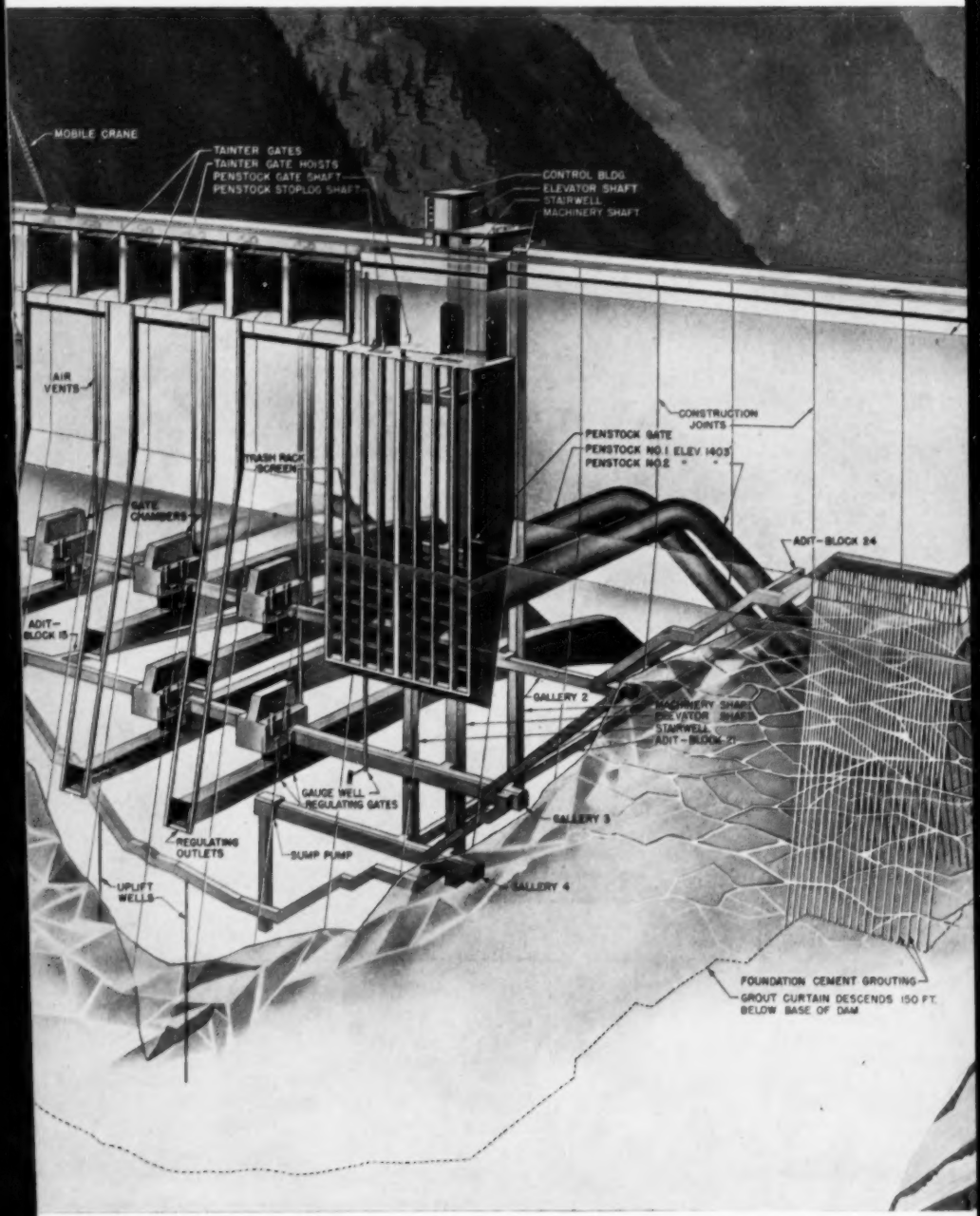
ACI News Letter

Vol. 28, No. 12 JOURNAL of the AMERICAN CONCRETE INSTITUTE June 1957



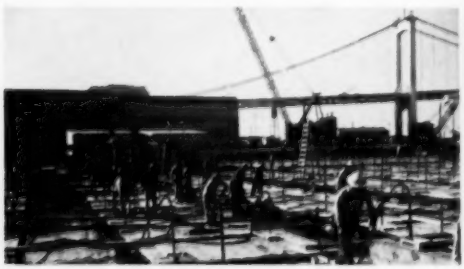
Detroit Dam details . . . p. 3

How world's largest underwater concrete placement was made at Camden drydock

Building one of the world's largest drydocks at the New York Shipbuilding Corp., Camden, New Jersey, required the underwater placement of a 134,200-cu. yd. Prepakt concrete floor slab. Here's how this unprecedented placement was made:

First move was direct placement of coarse aggregate from bottom-dump barges inside cellular sheetpile cofferdam. Barges arrived via Delaware River (rear).

Next, Intrusion grout was batched, mixed, pumped from Prepakt plant. I-P methods made possible economical construction of a gravity floor slab, avoiding costly hydrostatic relief of structure.



Underwater consolidation of aggregate was done from rafts. Live grout face was maintained throughout continuous six-week grouting operation.

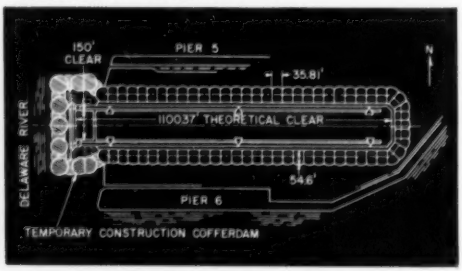


Diagram shows dimensions and location of drydock. Unreinforced Prepakt concrete slab is 17 to 25 feet thick.

Contractor: Merritt-Chapman & Scott Corp.

Consulting Engineers: Parsons, Brinckerhoff, Hall & Macdonald.

With grouting completed, slab was cured for 30 days. Dewatering later revealed a monolithic slab—a firm base for new Forrestal-class carriers.

Intrusion-Prepakt, Inc., Room 568, Union Commerce Bldg., Cleveland 14, Ohio. In Canada: Intrusion-Prepakt, Ltd., 159 Bay Street, Toronto, Ontario.

INTRUSION-PREPAKT, INC.

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Intrusion and Prepakt are trade marks of Intrusion-Prepakt, Inc., whose methods and materials are covered by U. S. Patents Nos. 2313110, 2655034, 2733302 and others, also patents pending.

ACI

News Letter Contents

June 1957

On the Cover—An interior view of operating mechanisms, access galleries, and foundation grouting for Detroit Dam on the western slope of Oregon's Cascade Mountains, not far from Salem. Mass concrete control in Detroit Dam is discussed in detail by Roy R. Clark in this month's *Proceedings*, p. 1145 in the JOURNAL.

This illustration is taken from a view prepared by Eric Gustavus Michelson for the Portland District, Corps of Engineers, U.S. Army.

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ACI members approve

NEW STANDARDS ....

compression test evaluation
revised detailing manual

"Recommended Practice for Evaluation of Compression Test Results of Field Concrete (ACI 214-57)" and "Manual of Standard Practice for Detailing Reinforced Concrete Structures (ACI 315-57)" are new standards of the American Concrete Institute; they were approved by Institute members through letter ballots officially canvassed June 1, 1957.

ACI 214-57 discusses briefly the numerous variations that occur in the strength of concrete, and presents statistical methods which may be used in interpreting these variations. Criteria are offered for use in establishing specifications and maintaining required uniformity.

ACI 315-57 combines two previous standards ACI 315-51 (detailing of building structures) and ACI 315A-53 (detailing of highway structures) in a single new manual. Recommended methods and standard practices for preparing drawings for the fabrication and placing of reinforcing steel in concrete structures are presented. Typical engineering drawings and placing drawings illustrate the use of the standards. Tables, text, and drawings have been corrected to embody the provisions of the new ACI Building Code (ACI 318-56).

Committee heads

William A. Cordon, Utah State Agricultural College, Logan, is chairman of ACI Committee 214 which prepared the standard for evaluating compression tests. Raymond C. Reese, consulting engineer, Toledo, headed Committee 315, which made the revisions in the detailing manual.

Concrete for

CONCRETING OPERATIONS for the American Concrete Institute's new headquarters building in northwest Detroit were in full swing as the 1957 construction season opened. Late in March, general contractor Pulte-Strang, Inc., Ferndale, Mich., erected a field office, cleared the construction site, and began foundation excavation. In early April a sewer was installed to aid in draining seepage water from the excavation. All footings were in place by the end of April.

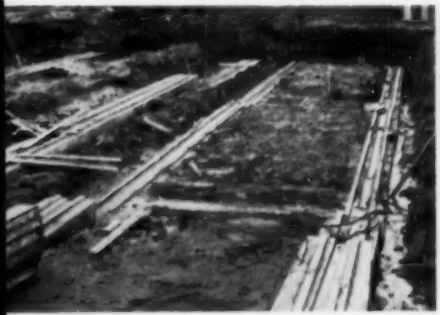
Because unfavorable soil conditions appeared during excavation, it was decided to lay the north wall footings and corridor footings on blue clay soil to avoid the unpredictable wet fine sand. Thus footings are of varying heights as can be seen in the photograph below. Continuous footing reinforcement consists of four #5 bars. A keyway was formed in the footing to tie into the walls (see photograph).

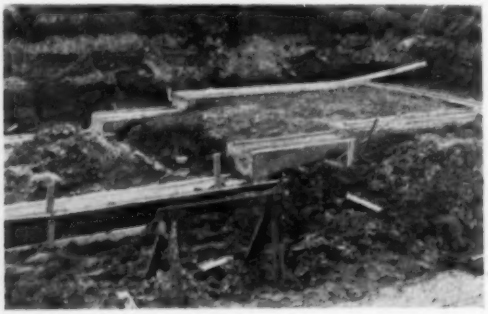
In May forms were erected and placement of concrete began for the basement walls. Standard steel panels 30 x 30 in. with numerous special sizes as required made up most of the forms, with special attention going to the columns and beams between and above the basement windows on north and south walls. Vertical and horizontal reinforcement—#5 bars—was placed at 10 in. on centers in all of the basement walls.

The ACI Building Committee, headed by Henry L. Kennedy, Dewey and Almy Chemical Co., Cambridge, Mass., continues its work into the final phases of the fund raising drive as the contractor prepares forms for on-the-job

Continued on p. 6

FOOTINGS—Over-all view of completed footings (left) shows north and south outer wall footings and footings for the central corridor walls. Profile shot at right shows how the footings were placed at several elevations because of variable soil conditions





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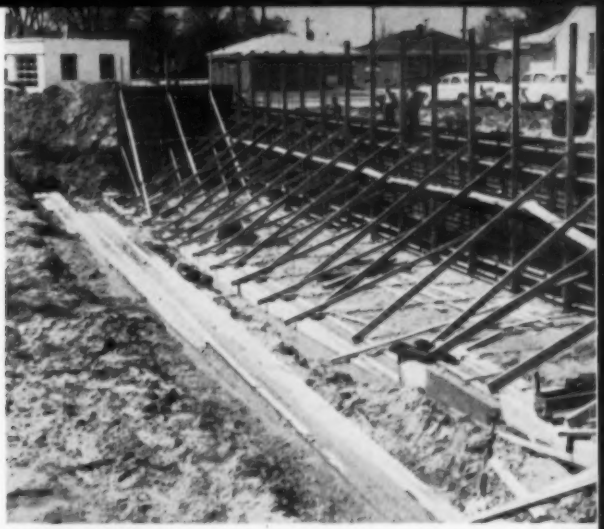
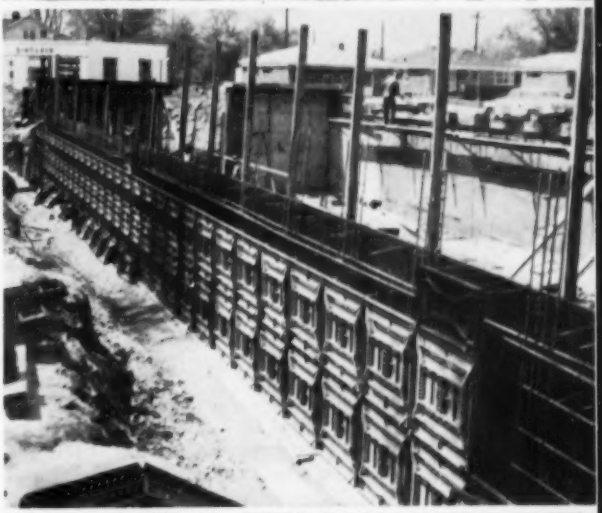
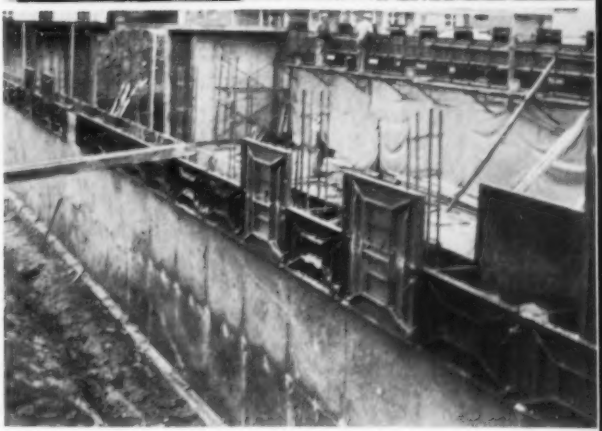


CONSTRUCTION SEQUENCE —Forms for north wall being erected; braces and wales have been arranged in place



The steel forms for the south wall rise following stripping of north wall, which is here being wet down. Steel is in place for columns which rise between basement windows



Workers in background erecting forms for beam above basement windows. Burlap shelter aids north wall curing. South wall forms stripped

MEN AT WORK—Concrete goes into forms for ACI headquarters wall. Worker on the left is operating vibrator to compact concrete already within forms. Inset photograph affords a detailed view of steel forms and the devices used to connect them. Numerous special sizes were used in addition to the standard 30 x 30-in. panels. The forms were supplied and their erection was supervised by the Economy Forms Corporation, of Des Moines, Iowa

precasting of the 46 sections of the folded plate concrete roof. Construction schedule calls for roof erection early in July.

Total contributions to the building fund, as of May 15, 1957, were $192,972.77, including pledges in the amount of $9,200.00. Contributions by category are listed below.

BUILDING FUND CONTRIBUTIONS

as of May 15, 1957

Cement producers	$62,612.00	Admixtures manufacturers	$ 6,158.93
Reinforcing steel industry	40,000.00	Membership at large	3,312.25
Engineers and architects in private practice	34,151.22	Comcrete products manufacturers	2,520.00
Contractors	20,445.00	Concrete machinery and specialty products	2,285.00
Ready-mixed concrete and aggregate industry	10,083.87	Special contributions	1,209.08
		Eastern Canada	995.42

Technical committee appointments

Listed below are committee members recently appointed to several of the Institute's technical committees. Included are *new* appointments only.

Committee 115—Research

Clayton M. Crosier
University of Kansas
Lawrence, Kan.

Charles E. Cutts
Michigan State University
East Lansing, Mich.

E. J. Ruble
Association of American Railroads
Chicago, Ill.

Committee 207—Properties of Mass Concrete

L. H. Tuthill
California Dept. of Water Resources
Sacramento, Calif.

Committee 212—Admixtures

C. R. Burgener
Civil Engineer
Vallejo, Calif.

Committee 215—Fatigue of Concrete

Charles E. Cutts
Michigan State University
East Lansing, Mich.

John M. McLaughlin
Purdue University
Lafayette, Ind.

Committee 315—Detailing Reinforced Concrete Structures

Dugald J. Cameron
The Fireproof Products Co., Inc.
New York, N. Y.

Dwayne M. Chryst
Hausman Steel Co.
Toledo, Ohio

Thomas R. Leonhardt
Raymond C. Reese, Consulting Engineer
Toledo, Ohio

Committee 325—Structural Design of Concrete Pavements for Highways and Airports

Wayne Woolley
Truscon Steel Division
Republic Steel Corp.
Youngstown, Ohio

Committee 331—Structures of Concrete Masonry Units

A. T. Hersey
Alpha Portland Cement Co.
Easton, Pa.

Committee 401—Specifications for Structural Concrete

Delmar Bloem
National Sand & Gravel Association
Washington, D. C.

Warner Howe
Gardner & Howe
Memphis, Tenn.

J. D. McFarlan
Robert & Co., Associates, Inc.
Atlanta, Ga.

Charles L. Nichols
Albert Kahn Associated Architects & Engineers
Detroit, Mich.

Raymond C. Reese
Consulting Engineer
Toledo, Ohio

R. C. Sandberg
Architect-Engineer
Rock Island, Ill.

Herbert M. Shilstone, Jr.
Shilstone Testing Laboratory
Houston, Tex.

Harry F. Thomson
Consultant
St. Louis, Mo.

Committee 605—Hot Weather Concreting

John L. Goetz
Southwestern Portland Cement Co.
Fairborn, Ohio

Continued on p. 9

LACLEDE HIGHWAY STEELS

speed underpass construction on new U.S. 40 expressway

Laclede's strong, yet lightweight reinforcing steels speed road construction work because they're easy to handle and place.

Missouri State Highway Department
Contractor: Frain-Colnon Contracting Company, St. Louis, Missouri

other Laclede highway steels are . . .

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center bars • recess joints • tie bars
accessories

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Continued from p. 7

Committee 609—Compaction of Concrete by Mechanical Means

Arthur A. Levison
Blaw-Knox Co.
Pittsburgh, Pa.

Committee 611—Inspection of Concrete

Marvin J. Hawkins
U. S. Bureau of Reclamation
Ephrata, Wash.

M. R. Smith
Corps of Engineers
Massena, N. Y.

Committee 612—Curing of Concrete

E. E. Bauer
University of Illinois
Urbana, Ill.

Committee 613—Recommended Practice for Proportioning Concrete Mixes

A. T. Hersey
Alpha Portland Cement Co.
Easton, Pa.

Harry H. Mitchell
Spartanburg Concrete Co.
Spartanburg, S. C.

Committee 617—Specifications and Recommended Practice for Concrete Pavements and Bases

E. E. Bauer
University of Illinois
Urbana, Ill.

R. O. Beauchemin
Beauchemin-Beaton-Lapointe
Montreal, P. Q.

Committee 622—Formwork for Concrete

F. H. Beinhauer
J. L. Simmons Co.
Decatur, Ill.

Committee 714—Concrete Bins and Silos

Clinton H. Chalmers
Chalmers & Bolton
Hutchinson, Kan.

Robert L. Hahn
Portland Cement Association
Chicago, Ill.

Carl C. McFarlane
Jones-Hettelsater Construction Co.
Kansas City, Mo.

Robert Van Epps
Portland Cement Association
Chicago, Ill.

Joint ACI-ASCE Committee 712

Jack R. Janney, American Concrete Corp., Chicago, will serve as chairman of the newly organized Joint ACI-ASCE Committee 712, Precast Structural Concrete Design and Construction. Members of the committee are:

Arthur R. Anderson
Consulting Engineer
Tacoma, Wash.

Joseph Appleton
Alabama Cement Tile Co.
Birmingham, Ala.

Maurice Bender
Joseph K. Knoerle and Associates
Baltimore, Md.

W. Burr Bennett, Jr.
Portland Cement Association
Chicago, Ill.

David P. Billington
Roberts and Schaefer Co.
New York, N. Y.

Martin K. Douglass
A. B. Sanderson and Co., Ltd.
Vancouver, B. C.

Paul Karr
Portland Cement Association
Chicago, Ill.

A. C. Scordelis
University of California
Berkeley, Calif.

The committee has been formed with the intention of developing a recommended practice for precast structural concrete design and construction.

TAC appoints Rohwedder

John L. Rohwedder, district engineer, U. S. Army Corps of Engineers, Rock Island, Ill., has been appointed for a 3-year term as chairman of ACI Committee 616, Coatings for Concrete.

Chicago committee for 1958 ACI convention organized

A. Allan Bates, chairman of the local committee for 1958 ACI Convention, to be held at the Morrison Hotel, Chicago, Feb. 25-28, 1957, has begun plans for an impressive series of concrete sessions. At a recent committee meeting H. C. Delzell, Concrete Reinforcing Steel Institute, was named chairman of the entertainment committee. Earl Beard, Department of Public Works, City of Chicago, will head a group to provide inspection tours. W. W. Wallace, Portland Cement Association, will handle publicity, and George F. Long, Inland Steel Co., will serve as treasurer of the local committee. H. F. Peckworth, American Concrete Pipe Association, will act as liaison between ACI and ASCE. Jack R. Janney, American Concrete Corp., is secretary of the local committee.

Other Chicago committee members include: William Armstrong, Material Service Corp.; C. J. Cain, Chicago Fly Ash Co.; and A. P. Christensen, Sumner Sollitt Co. R. H. Clore, Universal Atlas Cement Co., is also a committee member, as are E. M. Fucik, Harza Engineering Co.; O. W. Irwin, Rail Steel Bar Association; Douglas McHenry, Portland Cement Association; and C. E. Wuerpel, Marquette Cement Mfg. Co. Mrs. A. Allan Bates will head the group planning ladies' entertainment for the Chicago convention.

Fire tests to be made on prestressed concrete

Fire Prevention Research Institute, Los Angeles, has announced that a series of standard ASTM fire resistance tests will be run this summer on concrete spans prestressed with a special corrosion and heat resistant prestressing tendon manufactured by Western Concrete Structures Co., Inc., Los Angeles.

T. Y. Lin & Associates, Berkeley, are consultants for the prestressing of a test specimen, and Prof. George Troxell of the University of California, Berkeley, is consultant on the instrumentation and conduct of the tests. George D. Youngclaus is president of the Fire Prevention Research Institute.

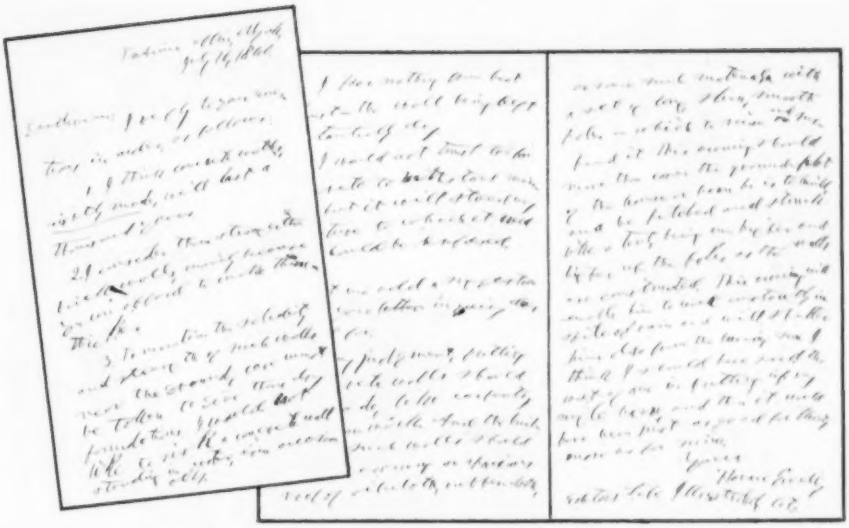
ASTM 60th annual meeting

The American Society for Testing Materials has scheduled its 60th annual meeting for June 16-21 in Atlantic City. Two evening sessions, Monday, June 17, and Tuesday, June 18, will be devoted to concrete; on Friday, June 21, papers dealing with masonry will be featured.

The following subjects will be presented at the Monday evening meeting: freeze-thaw resistance of concrete as affected by method of test—H. L. Flack, U. S. Bureau of Reclamation; impulse testing of reinforced concrete beams—F. T. Mavis, Carnegie Institute of Technology, and M. J. Greaves, Arthur G. McKee Co.; performance tests of concrete truck mixers—Albert G. Timms, Worthington Corp; specifications for quality control of concrete—E. A. Abdun-Nur, consulting engineer, and L. H. Tuthill, California State Department of Water Resources; and cement-aggregate reaction in concrete of a Canadian bridge—E. G. Swenson, National Research Council of Canada.

On Tuesday evening four papers on concrete will be presented. Morton Sherman, Zonolite Co., will speak on insulating concretes and compressive strength. Stanton Walker and D. L. Bloem, both of National Sand and Gravel Association and National Ready Mixed Concrete Association, will discuss flexural strength testing of concrete. Measuring the rate of hardening of concrete by bond pullout pins is the subject to be presented by T. M. Kelly and D. E. Bryant, both of Master Builders Research Laboratories. Rounding out the Tuesday evening program, James L. Sawyer, Lone Star Cement Corp., will speak on wear tests on concrete using the German standard method of test.

On Friday morning the following series of papers on masonry will be presented. Carl A. Menzel, Portland Cement Association, will discuss "Fallacies in the Current Percent of Total Absorption Method for Determining and Limiting the Moisture Content of Concrete Block." E. L. Saxer and H. T. Toennies of the National Concrete Masonry Association will present a discourse on measuring shrinkage of concrete block. C. C. Connor and W. E. Okerson, New Jersey Bell Telephone Co., will speak on disintegration of mortar in brick walls.



. . . "I think concrete walls, *rightly made*, will last a thousand years"
—HORACE GREELEY, July 16, 1860

"Go concrete, young man"

Ninety-seven years ago Horace Greely had a few thoughts on concrete that recently came to light in an original letter furnished the Institute through the courtesy of Arthur M. Colomb, San Francisco.

The three-page letter, reproduced here in the bold script of the famous editor of the New York *Tribune*, was addressed to the Editors of *Life Illustrated* and dated July 16, 1860.

The letter, in its entirety, reads:

Gentlemen:

I reply to your questions in order, as follows:

1. I think concrete walls, *rightly made*, will last a thousand years.

2. I consider them stronger than brick walls, mainly because you can afford to make them thicker.

3. To maintain the solidity and strength of such walls near the ground, care must be taken to give them dry foundations. I would not like to risk a concrete wall standing in water, even occasionally.

4. 5. I fear nothing from heat or frost—the wall being kept substantially dry.

6. I would not trust too far to concrete to withstand moisture, but it will stand any moisture to which it need or should be exposed.

Let me add a suggestion which your letter inquiry does not call for.

In my judgment, putting up concrete walls should be a trade, like carpentry or masonwork and the builder of such walls should have his awning or spacious roof of oil-cloth, rubber cloth, or some such materials with a set of long, slim smooth poles on which to raise and suspend it. This awning should more than cover the ground plot of the house or barn he is to build, and should be pitched and stuck like a tent, being run higher and higher up the poles as the walls are constructed. This awning will enable him to work constantly in spite of rain and will shelter him also from the burning sun. I think I should have saved the cost of one in putting up my single barn; and then it would have been just as good for twenty more as for mine.

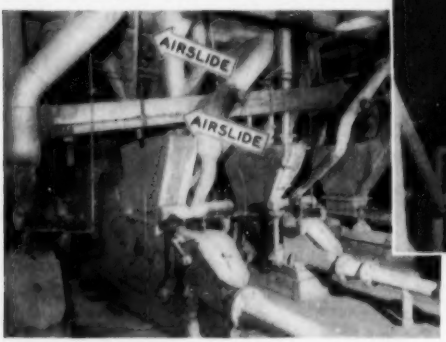
Yours,
s/Horace Greeley

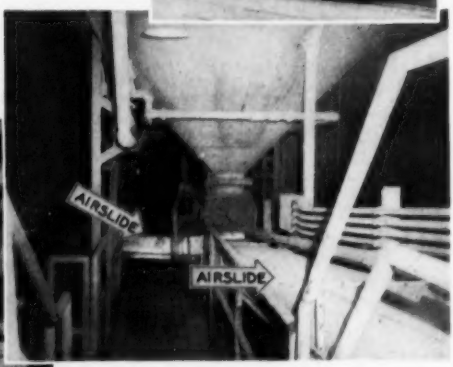
Editors Life Illustrated, City

Conveying cement from silos to bulk-cement truck.

Conveying cement from silos to hopper-bottom car.

Airslides conveying cement to five Fuller-Kinyon Pumps. Pumps convey cement to storage silos.





Airslide underneath storage silo. Fuller rotary valve under cone of silo for control of discharge to Airslide. Note branch Airslide, left.

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World Conference announces program on prestressing

Preliminary program announcement for the World Conference on Prestressed Concrete has been made by T. Y. Lin, conference coordinator, professor of civil engineering at the University of California, Berkeley. The July 29-August 2 meetings at the Fairmont Hotel, San Francisco, will include inspection trips, sightseeing opportunities, and social gatherings, as well as world coverage of prestressing developments in its technical sessions.

The July 29 session on materials and techniques will cover post-tensioning systems and new grouting methods used in Germany, prestressing steel under high stress, and the techniques and problems of prestressing strands. High-early-strength concrete and lightweight concrete will be discussed in relation to prestressing, also.

The July 30 session on bridges will feature a report on the Lake Ponchartrain bridge in Louisiana, as well as reports on prestressed bridge practice of the Bureau of Public Roads, the state of California, and the state of Illinois. Prestressed units, prestressed lift slabs, prestressed shells, and fire resistance of prestressed concrete will be treated in the session on prestressed buildings, July 30.

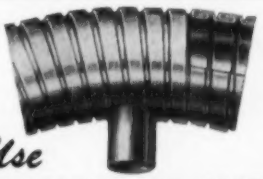
Two groups of technical films with commentaries will offer reports on prestressed structures in Taiwan and New Zealand, steel forms and steel strand used in the United States, and the manufacture of prestressed poles. Other films describe a pre-tensioning plant and various construction applications in the United States.

The August 1 session, with an international motif, will bring the story of recent developments in Italy's prestressed concrete industry, and a report on prestressed concrete buildings in earthquake areas. Prestressed continuous bridges in Germany will be discussed at the same session, along with prestressed suspension bridges in Belgium.

Airfield runways, piles, wharf members, and dams, all in prestressed concrete, will be considered at the afternoon session August 1. On August 2 the research session will have reports of work in progress at the University of Illinois, Lehigh University, Leeds University, the Technical University of Norway, and the University of California.

Closing conference session August 2 has scheduled the following papers: "Pre-Tensioning Plants and Production Methods in the U.S.A.;" "Multiple-Unit Construction in England;" and "Automation in Prestressed Units, U.S.S.R." Proceedings of the entire conference, comprising all preprinted papers in addition to those presented orally at the conference, will be available at $10 per copy.

The department of engineering and university extension at the University of California are presenting the conference in cooperation with the American Concrete Institute, American Association of State Highway Officials, American Institute of Architects, and American Society of Civil Engineers. Other cooperating sponsors are: Associated General Contractors of America, Association of American Railroads, International Federation for Prestressing, National Science Foundation, Portland Cement Association, Prestressed Concrete Institute, and Structural Engineers Association of California.



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precast roof panels used by air force

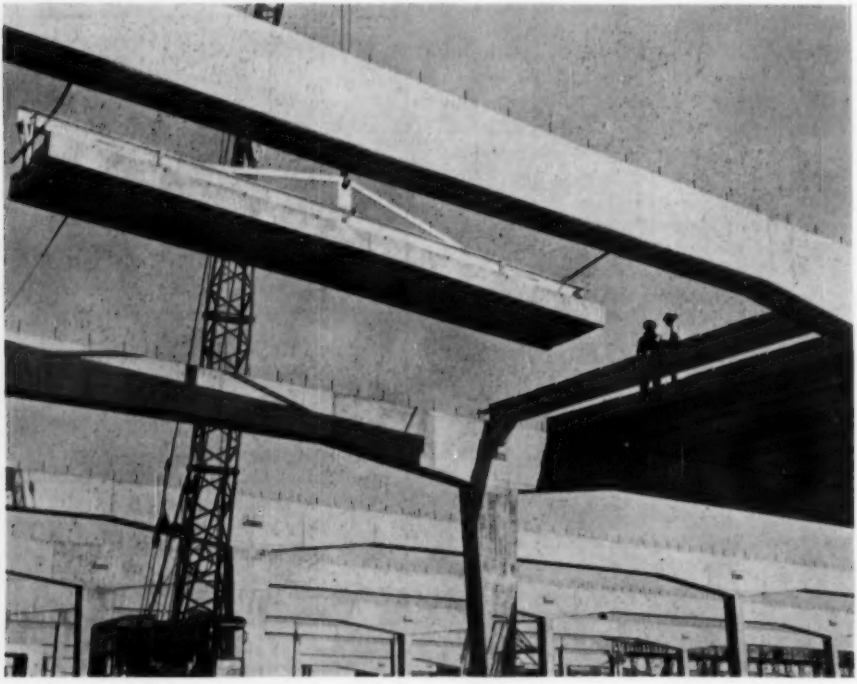
SOME 9200 THIN SHELL PRECAST roof panels made with expanded shale aggregate will be used to roof 1,500,000 sq ft of warehousing under construction at McClellan Air Force Base near Sacramento. Each panel is 33 ft 4 in. x 5 ft, with cross section as shown in the illustration. They are being cast 60 at a time in a casting yard near the erection site.

Two single-story warehouses of identical design, separated only by a railroad spur running through the site, are being built. Floors are 3 ft 9 in. above track height, and each warehouse is divided into bays 200 x 400 ft. Sprawling over 35 acres of the western portion of the air base, one warehouse is 400 x 1800 ft, and the other 400 x 2000 ft. The new structure will be used to store aircraft accessories and components, as well as some missile and radar parts. Target date for completion is January 1958.

Temperature problems

Temperatures at McClellan range from 85 to 110 F from May through October. Because of the size of the project, the contractor had the opportunity to do the same thing day after day under approximately the same

Precast roof panel of lightweight concrete being lowered into position during construction of the McClellan Air Force Base warehouse. Precast roof beam can be seen on the right side of picture, just in front of the workmen standing on the roof



conditions, and was therefore able to develop construction procedures to a fine degree. During the hot months surface cracks appeared in floor slabs cast during the morning hours. It was believed that the aggregate cooled down during the night and stayed cool until the fresh concrete started to set. Then under morning sun conditions the aggregate experienced a rapid change of temperature and cracking ensued. In the afternoon the aggregate had warmed up before the placing operations and the surface checking did not occur. The trouble was eliminated by fog spraying the slabs immediately after troweling.

Walls and girders

The exterior wall columns resting on the largest footings are 20 x 24 in. at the bottom, increasing in size to 20 x 42 in. at the top. Cast-in-place girders are continuous in the 400 ft direction of the building, except for an expansion joint near the middle. The 67-ft-span girders are reinforced top and bottom for their full length, have web reinforcement throughout; they are spaced 33½ ft on centers. Curing period for the girders was 21 days, but shoring was left in up to 28 days.

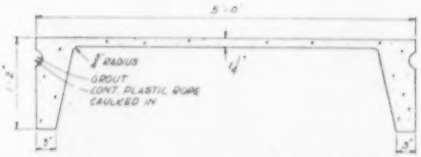
The tilt-up walls are precast reinforced concrete; exterior and shear walls are 6 in. thick. The 8-in. firewalls are constructed with lightweight expanded shale concrete, and abut the shear walls throughout the building at the end of each 200-ft bay. Wherever a firewall occurs, the shear walls and firewalls are erected before their columns are cast. Subsequent casting of the columns ties the two together, and this construction gives the wall a 6-hr fire rating.

Precast roof beams

The contractor had the option of casting-in-place or precasting the 800 roof beams for the warehousing, and elected to precast as preliminary studies indicated this to be the least expensive in this case. They set up nine roof beam forms, and nine can be cast daily since the specially designed metal forms are stripped in 18 hr. During the summer the beams were covered with wet burlap and an automatic fog spray used to keep the concrete damp enough to cure without cracking and checking. This water treatment was also used for the precast roof panels.

Casting the panels

Since this is the first time that roof panels of the type being constructed for the warehousing have been used in such quantity at an air force base, manufacturing of the panels is being watched closely. Every 250th panel is tested for deflection and recovery of deflection.



Cross section, precast concrete roof panel

A tolerance of only ¼ in. is permitted in over-all dimensions of the castings so the units are cast in rigid steel molds. A mineral oil bond-breaking agent is applied immediately before the light mesh reinforcement is placed. As the mix is placed in the forms, an air vibrator is used along the top of the panels. The vibrator serves primarily as a screed, vibrating only the top of the mix.

Panels are left in the forms 48 hr; when they are removed a light membranous curing spray is applied. They are then stacked near the casting yard and allowed to cure for 60 days. A modified lumber carrier is used to pick up the panels and transport them from casting yard to site (see illustration).

Continued on p. 16

In the foreground is metal form used for precasting special lightweight roof panels. Modified lumber carrier picks up panels and carries them to erection site

Waterstop
in place
in seconds!

LABYRINTH WATERSTOP after first pour has been made and form removed. The grooves receive the concrete from the second pour, providing an interlocking joint.

Just a few seconds were needed to nail this LABYRINTH WATERSTOP to the form . . . just a few seconds and water seepage worries were over before they could ever have a chance to start.

LABYRINTH WATERSTOP forms a waterproof bond between two pours. The corrugated ribs bond firmly with the concrete.

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Toronto, Ontario

Two in. of 1:6 perlite concrete is being applied for roof insulation. Then roofing felt and a five-ply asphalt will be used over the entire surface to form a built-up roof.

Revised warehouse design

The new warehouse is based on a standard design that has been used at other air force bases throughout the United States. However, some roof failures were experienced in previously constructed warehouses and, based on investigations which followed the failures, corrective changes are reflected in the McClellan warehousing.

Both girders and columns were strengthened over the original design. Critical areas in the top of the girders gained as many as six more #11 steel bars. The number of steel bars in the bottom of the girders remains the same, but the minimum size was increased from #9 to #10 bars. These changes give the girders approximately 40 percent more strength. Also, four additional bars were specified in the columns, and the size was changed from #10 to #11 on all column steel.

The office of the Air Force Installations Representative, South Pacific Region, headed by Col. Edwin M. Eads, is responsible for monitoring the work at McClellan. Design and construction contract responsibility is that of the South Pacific Division, Corps of Engineers, and the contract was let through the Sacramento District, Corps of Engineers.

Contract for the warehouse was awarded to four Sacramento firms, the Heller Construction Co., Campbell Construction Co., Erickson Construction Co., and the Lawrence Construction Co., who pooled their resources in a joint venture. Original design for the warehouse was by the L. Kooken Co., Baltimore. Design was modified and adapted to the site by the Tudor Engineering Co., San Francisco.

Raphael speaks at 1957 nuclear congress

Prof. Jerome M. Raphael, civil engineering department, University of California, Berkeley, delivered an address on "Structural Properties of Magnitite Concrete" at the 2nd Nuclear Engineering and Science Conference, which was held in conjunction with the 1957 Nuclear Congress, March 11-15, in Philadelphia.

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Sika

Precast concrete frame erected in 9 working days!

Placing prestressed spandrel beam 28′ x 36″ x 18″ at new Albert Godde Bedin, Inc. plant, Depew, N. Y. Precast columns shown are 24′ x 14″ x 14″.

•The entire frame of this industrial plant in Depew, N. Y.—with a total floor area of 25,617 sq. ft.—was erected in *9 working days.*

Such fast work resulted from the use of prestressed concrete beams, floor and roof channels and precast columns, precision made by Frontier Dolomite Concrete Products Corporation, Lockport, N. Y.

IN THE MANUFACTURE OF THESE PRECAST UNITS, Lehigh Early Strength Cement and steam curing were used to achieve maximum production efficiency and economy. The concrete reached 3500 PSI in 12 hours, permitting removal of units and re-use of forms in *less than half the time required with regular portland cement.*

This is typical of the advantages of Lehigh Early Strength Cement in modern concrete construction.

Owner: Albert Godde Bedin, Inc., New York City
Architect: John R. Weber, New York City
Engineer: Freyssinet Company, Inc., New York City
Contractor: George W. Walker & Sons, Inc., Buffalo, N. Y.

- LEHIGH EARLY STRENGTH CEMENT
- LEHIGH MORTAR CEMENT
- LEHIGH PORTLAND CEMENT
- LEHIGH AIR-ENTRAINING CEMENT

LEHIGH PORTLAND CEMENT CO.
Allentown, Pa.

Frontier Dolomite also manufactured the concrete block for the exterior walls. Blocks were made with Lehigh Air-Entraining Cement.

Wood screeding prestressed double tee, 42′ long, 4′ wide, 14″ deep, at Frontier Dolomite plant.

Positions and Projects

McHenry to attend 1957 atomic tests

At the invitation of the Federal Civil Defense Administration to appoint a member to observe the 1957 atomic test series at the Nevada test site of the Atomic Energy Commission, ACI President Walter H. Price has designated Institute vice-president Douglas McHenry, director of development, Portland Cement Association, Chicago, to represent ACI. The tests are scheduled to be held June 10-20, 1957.

Corning named to new position

Leo H. Corning, until recently director of promotion planning and engineering services for the Portland Cement Association, Chicago, has been named to the newly created position of chief consulting structural engineer for PCA. In his new position, he will serve as the association's leading authority in the field of structural engineering and as senior adviser in other fields of engineering. Mr. Corning has been with PCA since 1929.

Ideal Cement to build new facility

Cris Dobbins, president of Ideal Cement Co., Denver, has announced plans for the construction of a new cement plant near Albuquerque. Ideal has shipped cement into New Mexico for over 50 years, and has long owned a deposit of limestone a few miles east of Albuquerque.

Cost of the first stage of the installation will range from $10,000,000 to $12,000,000, with completion scheduled for early 1958.

Pipe association elects officers

Carl A. Bluedorn, Zeidler-Concrete Products Machinery Co., Waterloo, Iowa, was reelected president at the 49th annual convention of the American Concrete Pipe Association held recently in Washington, D. C.

E. F. Bespalow, Choctaw, Inc., Memphis, was reelected vice-president. Two new vice-presidents are J. W. Carson, American-Marietta Co., Chicago, and Peter Van Kuran, American Pipe and Construction Co., Los Angeles. John H. Bailey, Cretex Companies, Inc., Elk River, Minn., was reelected secretary, and Craig J. Cain, Continental Concrete Pipe Corp., Chicago, continues as treasurer.

New directors of the association are Harry W. Heath, Lock Joint Pipe Co., East Orange, N. J.; H. T. Rex, Superior Products Co., Detroit; and Joseph S. Jones, Bancroft and Martin Rolling Mills Co., South Portland, Me. Guiton Morgan, Austin Concrete Works, Inc., Austin, Tex., was also chosen as a director.

Severud, Elstad, and Kruger change firm name

Fred N. Severud, Eivind G. Elstad, and Max Krueger have announced a change in the firm name to Severud-Elstad-Krueger-Associates. Among ACI members who are associates in the firm are: Werner Gottschalk, Alfred J. Perrone, Thornton C. Kline, Vincent R. Cartelli, Michael Alexander, and John A. Zoldos. Firm's headquarters is in New York.

IMPORTANT

ACI Regional Meeting

SEATTLE

Benjamin Franklin Hotel

now scheduled for

November 5-6, 1957

Please note change of date

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CF&I OFFICES IN CANADA: Toronto • Montreal CANADIAN REPRESENTATIVES AT: Calgary • Edmonton • Vancouver • Winnipeg

DESIGNS NOVEL HEAVY DUTY LIFTING DEVICE

Confronted with the problem of lifting and moving 71-ton beams without tying up heavy cranes, Roy N. Hill, consulting engineer with Lakeland Engineering Associates, Inc., Lakeland, Fla., designed a hoist to utilize a small jack placed on top of the beam to be lifted, and under the end of the fulcrum of the lifting device.

This fulcrum is pinned by threaded clevises to lifting bolts cast vertically into each end of the beam. As the jack is elongated, it lifts the beam, even though the jack is bearing against the beam itself.

A horizontal bolt on the lifting device takes the horizontal thrust from the beam. The whole frame rolls on rails so that after the beam is lifted it may be pulled sideways to the storage area. The device was designed for Prestressed Concrete, Inc., Lakeland, Fla., fabricator of the large structural members.

Proporcionamiento del hormigon . . . ACI standard published in a new Spanish edition

"Recommended Practice for Selecting Proportions for Concrete (ACI 613-54)" has just been issued by the Institute in a Spanish-language edition. Metric system units have replaced customary English units of measure throughout the new edition, and measurements involving sacks of cement have been converted to a net content of 50 kg. Translation was by Victor Federico Pizano Thomen and Everaldo Antonio Rosa del Rosario, with certain revisions suggested by Federico Barona de la O.

These recommendations for proportioning provide tables for rapid selection of concrete proportions, along with examples of proportioning both air-entrained and non-air-entrained mixes. Adjustment of aggregate proportions due to moisture present in aggregates is illustrated. An appendix gives laboratory tests for physical properties of cement and aggregate.

The 26-page Spanish version, with covers, is available from ACI at 50 cents per copy.

Riverside Cement announces appointment

Lawrence L. Conley has been appointed sales manager of Riverside Cement Co., Los Angeles. He succeeds John C. Allen who retired after more than 36 years of service. Mr. Allen is continuing in a consulting capacity.

District engineer for PCA Philadelphia office

Lester E. Jordan has been appointed district engineer in charge of Portland Cement Association's Philadelphia office. He succeeds R. M. Reindollar, Jr., who resigned to join a Baltimore, Md., engineering firm.

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Grant to aid ASEE project

A $10,000 grant of the National Science Foundation will support the first phase of a comprehensive study of how American engineering colleges may attract and keep top-flight engineering teachers for their growing number of students.

The American Society for Engineering Education project, titled officially "The Development of Engineering Faculties," is under the direction of an executive committee headed by Harold L. Hazen, dean of the graduate school at Massachusetts Institute of Technology. Dr. William H. Miernyk of Northwestern University is executive director.

Corbetta elected board member

Roger H. Corbetta, president, Corbetta Construction Co., Inc., New York, was elected a member of the board of directors of the Concrete Industry Board, Inc., New York. Mr. Corbetta is ACI's representative on the CIB.

Hognestad moves to Marquette Cement

Eivind Hognestad formerly manager of the structural development section of the Portland Cement Association is now technical director of the Marquette Cement Manufacturing Co., Chicago. A member of ACI for the past 10 years he has written several JOURNAL papers and at present is a member of ACI Committee 318, Standard Building Code, and ACI-ASCE Joint Committees 321 and 326, Design of Reinforced Concrete Slabs, and Shear and Diagonal Tension, respectively.

Main announces election of officers

Chas. T. Main, Inc., Boston, has announced that at its annual meeting the following officers and directors were elected: chairman of the board, W. F. Uhl; president, W. M. Hall; vice-president, R. T. Colburn; treasurer, R. W. Logan.

Directors elected were F. M. Gunby, W. F. Uhl, W. M. Hall, R. W. Logan, M. Jacobs, G. R. Rich, and R. T. Colburn.

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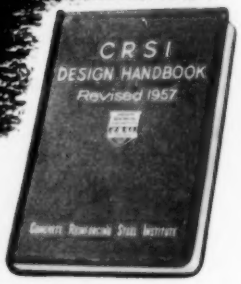

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Courtesy Lone Star Cement Corp.

FOURTEEN STORIES IN FOURTEEN WEEKS—Miami Beach prohibits building between December and March within 150 ft of any adjoining structure, so construction from foundations to lobby floor on the luxury resort hotel, Americana, was completed September through November. On April 1 the following year the contractor went into a high-speed schedule on the superstructure. Forms were filled with concrete one day and were stripped and jumped the next. Fourteen stories and roof were erected in 14 weeks, using high-early-strength concrete.
Architect Morris Lapidus, who also designed the Fontainbleau and the Eden Roc, has endowed the $17,000,000 Americana with distinctive beauty. Besides the 15-story guest unit, containing 475 rooms, there are 30 lanai suites in the gardens, and 100 cabanas adjoin the Olympic-sized swimming pool. Oboler and Clarke, Miami Beach, were structural engineers, Taylor Construction Co., Miami, general contractor

NRMCA elects officers

The 1957 officers for the National Ready Mixed Concrete Association have been announced. John W. Roberts, president, is associated with Southern Materials Co., Inc., Richmond, Va.; M. Eugene Sundt and F. Schouweiler are the new vice-presidents. Mr. Sundt is with Albuquerque Gravel Products Co., Albuquerque, and Mr. Schouweiler is with Old Fort Supply Co., Fort Wayne, Ind. The newly-elected treasurer, John B. Donovan, is with Valentine Concrete Co., Inc., Springfield, Mass. Thirty-two members were elected to the board of directors.

Kennison elected vice-president

After 42 years of active service with the Lock Joint Pipe Co., East Orange, N. J., Walter W. Trickey, vice-president in charge of research, has retired. He will remain with the company in the capacity of consultant and director.

Hugh F. Kennison has been elected vice-president in charge of engineering and research. Mr. Kennison has been chief engineer for the company the past 10 years.

Terrell C. Wesley, Jr.

Terrell C. Wesley, Jr., president of Wesley & Co., Inc., engineers and builders, Atlanta, Ga., died recently. He was also president of a Jacksonville, Fla., construction firm, Wesley of Florida, Inc., and headed Wesley Associates, an Atlanta promotion and development firm.

Arthur Sedgwick

Arthur Sedgwick, designer of modern bridges used on Ontario highways, died recently. During 45 years as chief bridge engineer for the Ontario Highways Department he supervised construction of 1187 major bridges and interchanges, and 6921 county road bridges. After his retirement in 1954 he acted as a bridge engineer consultant to the government. He had been a member of the Institute since 1935.

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Florsheim Shoe Company factory
and headquarters in Chicago

architect and structural engineers
Shaw, Metz & Dolio
Chicago, Illinois

general contractors
Campbell-Lowrie-Lautermilch
Chicago, Illinois

Lower over-all costs and design flexibility were the major factors which influenced architects Shaw, Metz & Dolio in their selection of reinforced concrete for the imposing new Florsheim Shoe Company factory and headquarters offices in downtown Chicago.

On many other important industrial projects and buildings from coast to coast, reinforced concrete is also providing better structures for less money. It is a flexible medium, inherently firesafe, and highly resistant to wind, shock, and quake. Furthermore, reinforced concrete buildings start quicker . . . are completed sooner because all necessary materials and labor are readily available from local sources. On your next job, design for beauty plus economy . . . design for reinforced concrete.

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Parsons elected by Turner

M. Herschel Parsons has been elected a vice-president of Turner Construction Co., New York. Joining the organization in 1933, he has been general superintendent since 1944. Many important projects, including the John Hancock Insurance Co. home office building in Boston and the Socony Mobil building in New York, have been under his supervision. He will now serve as a project executive in Turner's New York office.

Georgia Lightweight Aggregate expands

Georgia Lightweight Aggregate Co., Atlanta, producer of Galite expanded shale aggregate, recently completed the installation of additional productive capacity at its Rockmart, Ga., plant.

The expansion program comprised the installation of additional conveying systems, raw storage silo facilities, and one additional rotary kiln and rotary cooler. The new facilities constitute approximately 60 percent increase in productive capacity.

M. A. Koffman elected senior vice-president

Southwestern Portland Cement Co., Los Angeles, has announced the election of M. A. Koffman as senior vice-president. He has been with the firm since 1907.

Other elections announced by George E. Warren, president, are as follows: Robert H. Fielding, vice-president and treasurer; Felix S. McGinnis, Jr., vice-president and secretary; William C. Brophy, vice-president, marketing; and F. T. Sheets, Jr., vice-president, manufacturing.

University of Illinois civil engineering alumni schedule dinner during ACI convention week

Alumni and faculty of the department of civil engineering, University of Illinois, are making plans for a dinner at the Sherman Hotel, Chicago, Feb. 24, 1958. The February 1958 convention of the American Society of Civil Engineers and the 1958 annual convention of the American Concrete Institute, meetings which attract many Illini alumni and staff members, will both be held in Chicago the week of February 24. The committee in charge of the dinner is headed by Theodore W. Schroeder, of Schroeder and Simpson, Chicago.

Oregon Portland Cement completes expansion program

Production increase of 100 percent at the Lime, Ore., plant of Oregon Portland Cement Co. has been effected with the completion of a comprehensive expansion and modernization program. Construction at Lime included a new 350-ft kiln with complete clinker cooling system, new stack, new raw grind mill, new slurry basins, and new finish grind mill. Quarry facilities have been expanded to handle the added volume of rock needed for greater production.

New stack at Oregon Portland

Involving an expenditure in excess of $3 million, the year-long enlargement and improvement schedule now gives the Lime plant an annual production of 1,000,000 bbl. The company's Oswego, Ore., plant has a production capacity of 2,000,000 bbl yearly.

Who's Who This Month

Subcommittee II, ACI Committee 622

"Form Construction Practices," prepared by Subcommittee II, ACI Committee 622, appears on p. 1105 of this month's JOURNAL. Chairman of this subcommittee is Joseph R. Proctor, Jr., Markland Lock & Dam Project, Dravo Corp., Warsaw, Ky. Members of the subcommittee are N. L. Doe, Turner Construction Co., New York; Robert C. Johnson, Siesel Construction Co., Milwaukee; J. C. McCloskey, McCloskey and Co., Philadelphia; and O. G. Sharrar, O. W. Burke Co., Detroit. The report was compiled from replies to a questionnaire submitted to a selected group of contractors in the United States and Canada regarding existing practice in construction, design, and use of forms.

The subcommittee is now studying these replies and preparing its portion of a proposed recommended practice on formwork. This portion of the recommended practice will present recommended construction practices for safety, appearance, and economy.

ACI Committee 622, Formwork for Concrete, has Harry Ellsberg, Giffels and Vallet, Inc., Detroit, as chairman. Members of the main committee in addition to subcommittee members listed above are: Frank H. Beinhauer, J. L. Simmons Co., Inc., Decatur, Ill.; H. P. Cerrutti, Blaw-Knox Co., Pittsburgh; Edgardo Contini, Victor Gruen Associates, Beverly Hills; Vance J. Gray, of the Raymond C. Reese firm, Toledo; and Verne O. McClurg, McClurg, Shoemaker, and McClurg, Chicago.

Others on the committee are: Donald R. Peirce, Ammann and Whitney, New York; A. H. Pilling, Richmond Screw Anchor Co., Inc., Brooklyn; H. R. Puffer, Michigan State Highway Department, Lansing; M. L. Stephens, Dixie Form and Steel Co., San Antonio; P. R. Stratton, Hydro-Electric Power Commission of Ontario, Toronto; William R. Waugh, Office Chief of Engineers, Department of the Army, Washington, D. C.; and William H. Wolf, U. S. Bureau of Reclamation, Denver.

George C. Ernst

"Plastic Hinging at the Intersection of Beams and Columns," p. 1119, is contributed by George C. Ernst, professor of civil engineering, and director of the engineering experiment station at the University of Nebraska, Lincoln.

Professor Ernst graduated from the University of Michigan in 1925 and has been in academic work since 1930 at Iowa State College, the University of Maryland, and the University of Nebraska.

Author or co-author of many papers which have appeared in the JOURNAL, he is a member of ASCE, ASTM, SPEE, Sigma Xi, and Tau Beta Pi. He has been an ACI member since 1935.

Roy R. Clark

Roy R. Clark, who recently retired as head of the design branch, Portland District, U. S. Army Corps of Engineers, Portland, Ore., is the author of "Mass Concrete Control in Detroit Dam" on p. 1145. A member of ACI since 1937, he graduated from Oregon State College in mining engineering, after which he completed civil and structural engineering training at Cornell University. He received the professional degree of civil engineer in 1938 at Oregon State College. Prior to his service with the Corps of Engineers Mr. Clark had engaged in private practice as a civil and structural engineer for nearly two decades.

ACI's Construction Practice Award was presented to Mr. Clark at the 1957 annual convention for his paper "Bonneville Stilling Basin Repaired After 17 Years' Service," which appeared in the April 1956 JOURNAL.

ASA approves ACI 318-56

The American Standards Association has approved "Building Code Requirements for Reinforced Concrete (ACI 318-56)" as an ASA Standard with the designation ASA A 89.1-57, UDC 69.009.182:693.55.

NOW... Get better control of concrete set during warm weather

Construction progress photographs of Key West High School, Key West, Florida.
Architect: Wm. H. Merriam, Miami
Contractor: L. W. Ross, Miami

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COMPANY.....

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Honor Roll

February 1—April 30, 1957

G. B. Southworth proposed 8 new members this month putting him in first place with 12 credits. Phil M. Ferguson is in second place with 5 credits.

ACI membership means access to the JOURNAL which comprises all the latest technical data on the developments in concrete.

G. B. Southworth	12
Phil M. Ferguson	5
Luis Perez Cid	4
Louis A. Gottheil	4
James A. McCarthy	4
H. C. Pfannkuche	4
Walter H. Price	4
S. E. Acker	3
Jaime de las Casas	3
Ambrosio R. Flores	3
Martin J. Gutzwiller	3
Franklin B. Johnson	3
Henry L. Kennedy	3
I. Martin	3
John T. Young	3
Miles N. Clair	2½
James C. Amrhein	2
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LOOKING AHEAD

June 16-21, 1957—60th Annual Meeting, American Society for Testing Materials, Chalfonte-Haddon Hall, Atlantic City, N. J.

June 17-21, 1957—American Society for Engineering Education, Annual Meeting, Cornell University, Ithaca, N. Y.

June 23-29, 1957—International Bureau of Precast Concrete, Second International Congress and Machinery Exposition, Wiesbaden, Germany

June 24-29, 1957—Concrete Reinforcing Steel Institute, Annual Meeting, The Greenbrier, White Sulphur Springs, W. Va.

July 29-August 2, 1957—World Conference on Prestressed Concrete, Fairmont Hotel, San Francisco, Calif.

August 12-24, 1957—International Society of Soil Mechanics and Foundation Engineering, London, England

August 19-30, 1957—(Tentative) Seventh Pan American Highway Congress, Panama City, Panama

September 8-13, 1957—American Chemical Society, National Meeting, New York, N. Y.

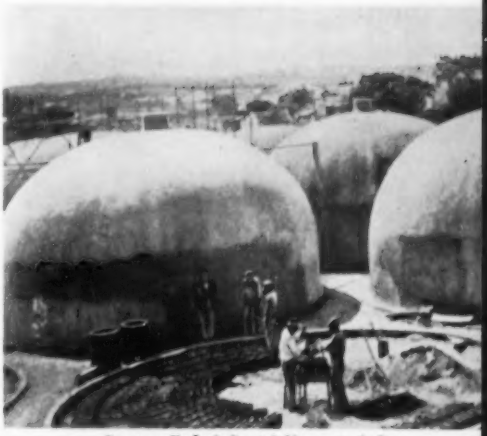
September 9-13, 1957—Instrument Society of America, 12th Annual Instrument-Automation Conference and Exhibit, Auditorium, Cleveland, Ohio.

November 5-6, 1957—ACI Regional Meeting, Benjamin Franklin Hotel, Seattle, Wash.

Vermiculite Institute elects officers

C. H. Wendel of Los Angeles, president of California Zonolite Co., was elected president of Vermiculite Institute, Chicago, at the group's 16th annual convention held in April at Fort Lauderdale, Fla.

William V. Culver, manager of Vermiculite-Norwest, Inc., Seattle, was named to the board of directors. Walter J. Bein of Chicago was reelected treasurer, and Edward R. Murphy was returned as managing director.



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Errata

The following correction should be made in "Tables for Circularly Curved Horizontal Beams with Symmetrical Uniform Loads," by Martin Schulz and Mauricio Chedraui, which appeared in the May 1957 JOURNAL.

p. 1037—Eq.(23) should read:

$$\phi, \text{ in radians} = \sqrt{6\,N/(N+1)}$$

* * *

The following correction should be made in "Diagonal Tension Strength of Reinforced Concrete T-Beams with Varying Shear Span," by A. F. Al-Alusi, which appeared in the May 1957 JOURNAL.

p. 1070—In Column 4 of Table 3, delete the prime sign following A_s.

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ACI SYNOPSES

Institute papers and reports of Proceedings V. 53 (July 1956-June 1957 ACI JOURNAL) currently available. Please order by title and title number.

STRUCTURAL DESIGN CONSIDERATIONS FOR PAVEMENT JOINTS 53-1

Price 50 cents.

SUBCOMMITTEE III, ACI COMMITTEE 325—July 1956, pp. 1-28

Considerations are presented for the structural design of joints in concrete pavements for highways and airports. A description, function, and classification of joints, assumptions and materials to be used, and joint design details are included. Special consideration is given to applicable design criteria for tie bars and dowels.

SHEARING STRENGTH OF REINFORCED CONCRETE SLABS 53-2

Price 50 cents.

RICHARD C. ELSTNER and EIVIND HOGNESTAD—July 1956, pp. 29-58

Presented as a research report without practical design recommendations, this paper reports the methods and results of experimental work on the shearing strength of reinforced concrete slabs subjected to a centrally located, concentrated load. Tests of thirty-nine 6-ft square slabs are reported. For 34 slabs, final failure was in shear by the column punching through the slab, in most cases after initial yielding of the tension reinforcement.

Major variables were: concrete strength, percentage of tension reinforcement, percentage of compression reinforcement, size of column, conditions of support and loading, distribution of tension reinforcement, and amount and position of shear reinforcement.

The test findings show that the shearing strength of slabs is a function of concrete strength as well as several other variables. An ultimate strength theory was developed, by which the slab behavior under load may be explained and the measured ultimate loads may be predicted with satisfactory accuracy.

PRESTRESSED CONCRETE PAVEMENT FOR AIRFIELDS.....53-3

Price 50 cents.

THOMAS CHOLNOKY—July 1956, pp. 59-84

Construction and testing of a 500 ft long and 12 ft wide experimental prestressed concrete slab are described. Loads on the prestressing tendons, development of prestressing in the slab, its load-carrying capacity, and the effect of heat thereon were studied. The results proved the superior behavior of the slab in all respects, and indicated that such construction could be utilized in future airfield pavement construction.

EARTHQUAKE RESISTANT DESIGN BASED ON DYNAMIC PROPERTIES OF EARTHQUAKES.....53-4

Price 50 cents.

G. W. HOUSNER—July 1956, pp. 85-98

A method of earthquake resistant design is proposed that takes into account the dynamic properties of earthquake ground motion and the dynamic properties of the structure. The method is applied to reinforced concrete cantilever chimneys and by appropriate simplifications the method is made sufficiently simple to be usable in ordinary design practice. The bending moments and shears given by this method differ markedly from those given by the percent g method of design. In particular, they give more economical designs for tall, flexible chimneys.

STRUCTURAL ANALYSIS BY DYNAMIC LOAD PARAMETERS.....53-5

Price 50 cents.

JAMES A. CHENEY—July 1956, pp. 99-112

Summarizes the method of normal modes which may be used in the analysis of structures under blast and earthquake excitation. Solutions are simplified to give equations involving several basic non-dimensional parameters. The equation which applies to all structural problems solved by the method of normal modes is:

$$\text{Deflection} = C \sum_{i=1}^{N} \frac{\left[\begin{matrix}\text{Characteristic}\\ \text{Function}\end{matrix}\right]\left[\begin{matrix}\text{Participation}\\ \text{Factor}\end{matrix}\right]\left[\begin{matrix}\text{Dynamic}\\ \text{Load Factor}\end{matrix}\right]}{\left[\begin{matrix}\text{Characteristic}\\ \text{Number}\end{matrix}\right]}$$

The bracketed terms are nondimensional factors, the C term carrying the required dimensions. Application is made to a reinforced concrete building under earthquake and blast loading.

SPACING OF REINFORCEMENT IN BEAMS . .53-6

Price 50 cents.

S. J. CHAMBERLIN—July 1956, pp. 113-134

The effect of spacing of parallel bars was studied in modified beams. Simulated variations in spacing were obtained by varying the width of the concrete at the steel in different specimens. Two-point symmetrical loading was used on one- and two-bar specimens made with two different concretes. Steel consisted of #4 bars—plain, old-style deformed, and modern deformed, and one modern #6 bar. Embedded length-diameter ratios varied from 6 to 21.33. Bar slippages at the load points and at the free ends, deflections, and steel strains were measured. Ultimate loads increased with wider spacing until tensile failures developed. Measured bar slippages were greater for the narrowest spacing than for the others. All plain-bar beams failed by excessive slippage of the steel. Deformed-bar beams which did not fail in tension failed either by rupture of the concrete along a horizontal plane at the centerline of the steel or in combination with diagonal tension. Results indicate that an effective clear spacing of three bar diameters may be required.

CONSIDERATIONS FOR CONSTRUCTION OF SUBGRADES AND SUBBASES FOR RIGID PAVEMENT.....53-7

Price 50 cents.

SUBCOMMITTEE I, ACI COMMITTEE 325—Aug. 1956, pp. 145-156

The approach to the study of subgrades and subbases is motivated by economy in solving pavement problems created by nationwide variation in soil types. The major problems of concern in the design of rigid pavements are discussed.

Soil classification and its limitations are discussed, the bases for the most popular systems are described briefly. The major properties that should be ascertained before a material is used as an integral member of the pavement system are considered and methods of test are referenced to standard specifications. Subbases are discussed from the standpoint of use in rigid pavement systems as well as their requirements for satisfactory service.

SOME IMPLICATIONS OF RECENT DIAGONAL TENSION TESTS.....53-8

Price 50 cents.

PHIL M. FERGUSON—Aug. 1956, pp. 157-172

On the basis of the observed cracking which occurs when a beam fails in diagonal tension without stirrups and away from complicating loads and reactions, a hypothesis of unrestrained failure is developed. This hypothesis assumes each step in the cracking pattern as a tension failure which can be rationalized in terms of the conventional combined stress formula.

Failures of beams somewhat restrained by reactions or loads, of beams of large shear span, and of footings are discussed in terms of this hypothesis.

Finally, two exploratory series of tests are reported. The first investigates the effect of extra or multiple loads and suggests that higher shear strengths are available near supports. The second series indicates that much of the increased capacity associated with small shear spans is lost if the loads are applied as shears over the depth of the beam or if the reaction is applied as a shear.

CONDUCTION CALORIMETER FOR MEASURING HEAT OF HYDRATION OF PORTLAND CEMENT AT ELEVATED TEMPERATURES AND PRESSURES.....53-9

Price 50 cents.

N. C. LUDWIG and S. A. PENCE—Aug. 1956, pp. 173-184

An apparatus for measuring continuously the rates and total amounts of heat liberated when cement compositions and water react at temperatures in the range of 80 to 350 F and at pressures from atmospheric to 10,000 psi is described. The method of calibration and test procedure are given.

Typical test results obtained on portland cement pastes cured at 100 F and at various pressures show that the rates and total amounts of heat liberated are increased by pressure at early ages.

BHAKRA DAM—DESIGN AND CONSTRUCTION FEATURES.....53-10

Price 50 cents.

C. L. HANDA and O. P. CHADHA—Aug. 1956, pp. 185-204

The Bhakra Nangal project is one of the multipurpose projects being constructed in India for irrigation and power. Major feature of the project is Bhakra Dam, a 680 ft high gravity concrete structure. General design features of Bhakra Dam are described including geology of the dam site, layouts, galleries, outlets and spillway, and foundations.

In the section on construction of the dam, aggregate cooling, temperature control of the concrete to minimize cracking, mix proportioning, plant layout, and concreting set-up are described. Considerable attention is given to the raw materials, particularly the aggregate and pozzolans, and another section covers various concrete investigations.

AN EXPRESSION FOR CREEP AND ITS APPLICATION TO PRESTRESSED CONCRETE.....53-11

Price 50 cents.

CEVDET Z. ERZEN—Aug. 1956, pp. 205-214

A simple expression for total strain (elastic plus creep) is given. The equation for the total strain is then used in determining the loss of stress in the prestressed beams due to creep of concrete. Resulting analysis indicates that the losses in the prestressed beams may be calculated if the variation of modulus of elasticity of concrete with time and the creep equation of concrete are known.

EMPIRICAL TIME-STRENGTH RELATIONS OF CONCRETE.....53-12

Price 50 cents.

MYRON L. GORAL—Aug. 1956, pp. 215-224

Modern design concepts and intense competition with other structural materials make it necessary for the contractor of concrete structures to safely improve methods of scheduling concreting operations. Anticipation of the age at which concrete will be sufficiently strong for subsequent operations enables the contractor to plan equipment and personnel in advance of needs and to substantially reduce waiting time. Time-strength forecasting is of particular value in the scheduling of form stripping, removal of shores, handling or erecting precast structural elements, and transferring prestressing forces.

STRENGTH OF A CONCRETE SLAB PRESTRESSED IN TWO DIRECTIONS.....53-13

Price 50 cents.

A. C. SCORDELIS, K. S. PISTER, and T. Y. LIN—Sept. 1956, pp. 241-256

Elastic behavior and ultimate strength of a full size concrete slab prestressed in two directions were investigated. Prestressing was accomplished by means of unbonded post-tensioned cables. The slab was supported only at the four corners, simulating a lift flat slab. It was loaded uniformly by means of air pressure in plastic bags. Experimental deflections and strains were checked against classical elastic theory. Observed ultimate strength was compared to that obtained by the crack-line theory as applied to prestressed slabs.

LINING OF THE TECOLOTE TUNNEL.....53-14

Price 50 cents.

E. R. CROCKER—Sept. 1956, pp. 257-276

Special problems encountered in excavating and concrete lining the Tecolote Tunnel near Santa Barbara, Calif., are described. The main problem was inflow of water up to 9000 gal. per min at temperatures which reached 117 F. Methods of overcoming problems, among the most difficult in Bureau of Reclamation construction undertakings, are described, and information on concrete materials, mixes, and placing procedures is presented.

THEORY OF THE STRESSES INDUCED IN REINFORCED CONCRETE BY APPLIED TWO-DIMENSIONAL STRESS.....53-15

Price 50 cents.

BRUCE H. FALCONER—Sept. 1956, pp. 277-294

This paper presents a theory of the stresses which are induced in concrete, reinforced in up to two directions, when under applied two-dimensional stress. It is based on convenient simplifying assumptions of the modes of failure. These assumptions are that failure will occur when either redistributions of internal stress cannot relieve tensions greater than yield in the reinforcement, or when induced compressions in the concrete exceed the ultimate compressive strengths of plain concrete.

Although the actual stresses within reinforced concrete are, in general, indeterminate under given loadings, it is shown that the stresses lie within computable regions of magnitude. Consequently, the theory can be used for the computation of quantities and orientations of reinforcement which are consistent with desired ultimate strengths. This application should prove useful in planning the reinforcement of shear walls, deep beams, and normal beams. As a particular and illustrative case of the theory, consideration is given to the reinforcement of concrete to carry shear plus axial load. An explanation is offered for the experimentally observed high shear strengths of lightly stirruped beams.

In an appendix the theory is applied to a consideration of

the strengths of normal or "shallow" reinforced concrete beams, in which the longitudinal reinforcement is customarily located only near the top and bottom of the cross sections. The theory, as applied, purports to predict the shear strengths of "ideally reinforced" beams with given percentages of web reinforcement, presuming that the reinforcement has marked yield stresses. A comparison is given with the results of tests conducted at the University of Illinois.

SOME EFFECTS OF CARBON DIOXIDE ON MORTARS AND CONCRETE.....53-16

Price 50 cents.

I. LEBER and F. A. BLAKEY—Sept. 1956, pp. 295-308

Tests have been made to determine the effect of gaseous carbon dioxide on the strength and shrinkage of mortars and concretes. Results from work previously published appeared somewhat contradictory, but it now seems that the strength is increased and shrinkage decreased if specimens undergo a period of curing in carbon dioxide immediately after demolding.
On the other hand, an immediate sharp increase in shrinkage is recorded if specimens are allowed to dry for several days before carbon dioxide treatment is started. The contraction does not continue with time, but appears to be stabilized.
The influence of carbon dioxide under pressure, and of storage in air free from carbon dioxide were studied briefly. Some consideration has been given to the way in which the gas is bound by the cement.

ANALYSIS OF INELASTIC BENDING STRESS IN CONCRETE BEAMS.....53-17

Price 50 cents.

JAMES M. PRENTIS—Sept. 1956, pp. 309-318

A method is given for determining the inelastic bending stresses in a concrete beam as it is tested to destruction. It is necessary only to measure the strain distribution in the concrete at a succession of load stages. The steel force is also deduced from these readings. A sample calculation illustrates the method.

DESIGN CONSIDERATIONS FOR CONCRETE PAVEMENT REINFORCEMENT FOR CRACK CONTROL.....53-18

Price 50 cents.

SUBCOMMITTEE IV, ACI COMMITTEE 325—Oct. 1956, pp. 337-362

Considerations pertinent to the design of distributed reinforcement for crack control have been suggested. Attention has been devoted to characteristics of subgrade frictional resistance, and to the relation between steel stress and crack width.
A rational method for determining coefficient of subgrade friction is advanced which follows conventional lines.

AUDITORIUM FRAMED WITH PRESTRESSED ROOF GIRDERS.....53-19

Price 50 cents.

ERIC C. MOLKE—Oct. 1956, pp. 363-374

Design and construction features of 146-ft roof girders for Springfield, Mo., high school auditorium are discussed. Cast of 5000-psi concrete and prestressed on the ground, the girders were raised between twin concrete columns by the same jacks used for prestressing. Girders were simply supported temporarily while precast roof panels were erected, and frame continuity was later introduced by prestressing the girders to the columns. Stability requirements during construction as well as for the completed structure are considered.

PROPERTIES OF LIGHTWEIGHT AGGREGATES AND LIGHTWEIGHT CONCRETES.....53-20

Price 35 cents.

G. W. WASHA—Oct. 1956, pp. 375-382

Presents condensed history of use of lightweight aggregate. Lightweight concrete is divided into: cellular or foam concrete; no-fines or "popcorn" concrete; and lightweight-aggregate concrete. Properties of lightweight concrete are summarized. Lightweight aggregates, both mineral and vegetable, are enumerated, and the desirable and actual properties of lightweight mineral aggregates are discussed in some detail.

STRUCTURAL LIGHTWEIGHT-AGGREGATE CONCRETE.....53-21

Price 50 cents.

RALPH W. KLUGE—Oct. 1956, pp. 383-402

Properties of structural lightweight-aggregate concrete are treated, including a discussion of the proportioning and control of concrete mixtures containing lightweight aggregate, some of the physical characteristics of plain concrete, as well as certain structural properties of reinforced lightweight concrete with comments on their relation to the design of structural elements. This is an attempt to gather together all of the related data available, both published and unpublished, and present this information as a guide in the use of lightweight aggregates for structural concrete.

HELICOIDAL STAIRCASES OF REINFORCED CONCRETE.....53-22

Price 50 cents.

VICTOR R. BERGMAN—Oct. 1956, pp. 403-412

The analysis of a helicoidal staircase involves torsional moments as well as bending moments and shears and is consequently somewhat more difficult than that of a straight staircase. However, if the staircase is reduced to its horizontal projection, the problem becomes quite tractable since it resolves itself into that of a fixed-end, curved beam loaded normal to its plane of curvature.
This paper covers determination of the bending moment, torsional shearing stress, shear reinforcement, longitudinal reinforcement, and design at the supports.

FATIGUE TESTS OF PRE-TENSIONED PRESTRESSED BEAMS.....53-23

Price 50 cents.

A. M. OZELL and E. ARDAMAN—Oct. 1956, pp. 413-424

Fatigue tests were conducted to determine the behavior of pre-tensioned concrete beams prestressed with 7/16-in. seven-wire strands. Eight beams, 6 in. x 8 in. x 20 ft, with a center load, were tested to obtain some solutions to the following questions: Is the use of 7/16-in. seven-wire strand feasible from the standpoint of repetitive loads? Does a beam pre-tensioned with 7/16-in. strand fail in fatigue because of bond failure in the concrete or by breaking in the strand? What is the magnitude of changes in the load-deflection characteristics influenced by fatigue damage? What amounts of permanent set does a beam undergo when subjected to repetitive loads?
Pilot test results indicated that: (1) the use of 7/16-in. seven-wire strands is feasible; (2) the failure of the beams was due to the breaking of wires in the strands by fatigue; (3) load-deflection relationship was affected slightly during the first 30,000 cycles but greatly just prior to failure of the beam; (4) the permanent set was also small at first but increased appreciably just before failure. Results further indicated that no shear cracks were developed near the supports during the fatigue tests. It was possible to draw a load-versus-failure-cycle diagram from the data obtained in these tests.

CONSIDERATIONS IN THE SELECTION OF SLAB DIMENSIONS.....53-24

Price 50 cents.

SUBCOMMITTEE II, ACI COMMITTEE 325—Nov. 1956, pp. 433-454

The principal dimensions of a pavement slab are length, width, and thickness. These dimensions and the factors which determine them are discussed separately and typical examples are given of the determination of slab thickness for specific sets of conditions.

GUIDE FOR ULTIMATE STRENGTH DESIGN OF REINFORCED CONCRETE.....53-25

Price 75 cents (in special covers).

CHARLES S. WHITNEY and EDWARD COHEN—Nov. 1956, pp. 455-490

This paper is intended to serve as a supplement to the ACI Building Code (ACI 318-56) which permits the use of the ultimate strength method for the design of reinforced concrete members. It presents the method in its simplest form with working equations and charts to aid in their application. It aims to give the designing engineer all the information that he needs for the use of the ultimate strength method in accordance with the recommendations of the report of the ACI-ASCE joint committee on ultimate strength design.

Regarding those problems not covered by the Code such as consideration of shear, bond, and deflections, recommendations are made based on the writers' practice.

LIGHTWEIGHT AGGREGATES FOR CONCRETE MASONRY UNITS.....53-26

Price 50 cents.

C. C. CARLSON—Nov. 1956, pp. 491-508

The role of mineral lightweight aggregates in the production and utilization of concrete masonry units is discussed. Differences between lightweight and heavyweight aggregates having influence in block manufacturing procedure are cited and the means for accommodating them are given. Various physical properties of lightweight aggregate concrete masonry wall construction are described and compared to those of heavyweight aggregate. Some mention is made of special uses of lightweight aggregate masonry units for precast and cast-in-place floor and roof construction.

INSULATING CONCRETES.....53-27

Price 50 cents.

R. C. VALORE, JR.—Nov. 1956, pp. 509-532

Mix proportioning, mixing methods, and physical properties are reviewed for insulating concretes of the types in which structural properties are secondary to thermal insulation value. Densities for four compressive strength ranges are given. Thermal conductivity data from different sources are compared as a function of density. Data are reviewed on other strength properties—elasticity, water absorption, frost resistance, drying shrinkage, and thermal expansion.

Properties often considered in relation to insulating concretes are fire resistance, sound insulation, and sound absorption. Data are given on these properties for lightweight aggregate concretes generally and for concretes used primarily for thermal insulation. The sections on mechanics of sound insulation and absorption are intended to dispel some misconceptions on these subjects in relation to other physical properties of concrete.

PRESTRESSED BRIDGE DESIGNED FOR CRANE LOAD AT NIAGARA RIVER WEIR.53-28

Price 50 cents.

A. M. LOUNT—Nov. 1956, pp. 533-544

Cranes which operate gates of a control weir on the Niagara River cause heavily eccentric live loading on the 1512-ft supporting bridge. Bridge designer selected a homogeneous grid system of longitudinal girders tied together by diaphragms, covered with a 7-in. slab acting compositely with the longitudinal girders. All components of the grid are prestressed. Design considerations of transverse bending stiffness and torque rigidity are discussed, and step-by-step method for exact structural analysis of the grid is summarized. Construction features are treated briefly with emphasis on shear connectors, stirrup spacing, and prestressing system.

PARTICLE INTERFERENCE IN CONCRETE MIXES.....53-29

Price 50 cents.

B. J. BUTCHER and H. J. HOPKINS—Nov. 1956, pp. 545-556

C. A. G. Weymouth's theory of particle interference postulates that fine particles infiltrate into the voids of larger particles. The authors' examination of Weymouth's method of calculation has shown his results to be in conflict with recognized physical laws. They advance a new method of applying the Weymouth criterion for particle interference in concrete mixes, based upon a consideration of the complete grading of solids instead of applying the criterion in turn to each successive size group.

PROPOSED RECOMMENDED PRACTICE FOR EVALUATION OF COMPRESSION TEST RESULTS OF FIELD CONCRETE.....53-30

Price 50 cents.

ACI COMMITTEE 214—Dec. 1956, pp. 561-580

Statistical methods provide valuable tools for assessing results of strength tests, and such information is also of value in refining design criteria and specifications. The report discusses briefly the numerous variations that occur in the strength of concrete and presents statistical methods which are useful in interpreting these variations. Criteria are offered that can be used to establish specifications and maintain required uniformity.

MACKINAC BRIDGE PIER CONSTRUCTION.53-31

Price 50 cents.

R. E. DAVIS, JR. and C. E. HALTENHOFF—Dec. 1956, pp. 581-596

Construction of the Mackinac Bridge, which will link the upper and lower peninsulas of Michigan, utilized the prepacked method for placing over 400,000 cu yd of concrete in the substructure.

Coarse aggregate for the concrete was placed directly in the cofferdams or caissons by self-unloading ships at rates of up to 2500 tons per hr. The voids in the coarse aggregate were intruded with heavily sanded grout which was pumped from a floating mixing plant. By such grouting, prepacked concrete, containing as little as 2.4 sacks of cement per cu yd for a compressive strength of 3000 psi, was produced at a maximum of 6250 cu yd per day.

ULTIMATE FLEXURAL ANALYSIS BASED ON STRESS-STRAIN CURVES OF CYLINDERS.....53-32

Price 50 cents.

G. M. SMITH and L. E. YOUNG—Dec. 1956, pp. 597-610

Describes a stress block for ultimate load analysis based upon the stress-strain relation of 6 x 12-in. cylinders. The stress-strain relation from a cylinder, which includes a decrease in stress beyond the ultimate, is described by a single continuous function. The function is used to compute the total compressive force in the compression zone, position of neutral axis, and ultimate moment. The computed values of total compressive force, neutral axis location, and ultimate moment are compared with actual test values of reinforced concrete beams. The mode of failure is predicted for beams of near balanced design.

The approach described leads to a more accurate analysis of beams reinforced with more than one layer of steel.

PROPOSED MANUAL OF STANDARD PRACTICE FOR DETAILING REINFORCED CONCRETE STRUCTURES.....53-33

Price 35 cents.

ACI COMMITTEE 315—Jan. 1957, pp. 617-624

The manual presents recommended methods and standards for preparing drawings for the fabrication and placing of reinforcing steel in reinforced concrete structures. The previous ACI Standards ACI 315-51 (detailing of building structures) and ACI 315A-53 (detailing of highway structures) have been combined into one manual.
Typical engineering drawings (and, for buildings, placing drawings as well) illustrate the use of the standards.

RIGID FRAME FAILURES.....53-34

Price 50 cents.

BOYD G. ANDERSON—Jan. 1957, pp. 625-636

The fundamental behavior of concrete members in transferring shear load is not fully understood, and in some cases designs have resulted in costly failures. One such failure occurred when portions of some U. S. Air Force rigid frame warehouses collapsed. General nature of distress is described, materials and construction procedure are analyzed briefly. A critical review of the design suggested some points subject to question. Some general comments are offered on shear design.

LABORATORY INVESTIGATION OF RIGID FRAME FAILURE.....53-35

Price 60 cents.

RICHARD C. ELSTNER and EIVIND HOGNESTAD—Jan. 1957, pp. 637-668

An experimental investigation into the causes of failure in a rigid frame warehouse is reported. The type of diagonal cracking that caused the failure was reproduced in the laboratory, revised frame designs for future construction were tested, and remedial measures were developed to strengthen existing frames by prestressed steel strapping applied externally.
Though further studies are needed to clarify completely the fundamental mechanism of failure, it is believed that the failure took place by a combination of diagonal tension due to dead load and axial tension due to shrinkage and temperature change. It is considered highly probable that the type of distress involved can be avoided by sufficient web reinforcement, sufficient extension of longitudinal reinforcement beyond the region of contraflexure, and effective expansion joints.

APPLICATION OF STEEL STRAP REINFORCEMENT TO GIRDERS OF RIGID FRAMES, SPECIAL AMC WAREHOUSES.....53-36

Price 50 cents.

REINHART R. LUNOE and GEORGE A. WILLIS—Jan. 1957, pp. 669-678

The test applications reported were made to develop a procedure for installing the steel strap reinforcement on full-scale girders in the field, and to work out solutions for any impractical features of the design specifications. Test applications were made on one rigid frame on which the roof deck had been placed and on one rigid frame without the roof deck. Buttering the inside of the corner protection angles with grout prior to clamping the angles in place was found to be the most practical method of insuring uniform bearing between the angles and the concrete girders. A standard model stretcher calibrated by a torque indicator attached to the operating handle is satisfactory for tensioning the straps to a reasonably accurate predetermined stress. Tapping the straps at the corners of the girder both during the tensioning operation and after sealing was necessary to develop higher stresses and to produce more nearly equal stresses in the straps on all sides of the girder.

RECENT INVESTIGATIONS OF THE SYSTEM LIME-ALUMINA-CALCIUM SULFATE-WATER AND ITS IMPORTANCE IN BUILDING RESEARCH PROBLEMS 53-37

Price 50 cents.

WILHELM EITEL—Jan. 1957, pp. 679-698

The general character of the complex calcium aluminate sulfate hydrates in the quaternary system is outlined on the basis of the previous publications of F. E. Jones and of revised determinations of the concentrations of the equilibrium solutions. New projection methods for the quaternary equilibria are given which are particularly obvious for solutions of very low concentrations in lime, calcium sulfate, and alumina hydrate. The importance of unstable crystallizations is emphasized, especially the formation of crystalline solutions of tetracalcium aluminate hydrate and $3CaO \cdot Al_2O_3 \cdot CaSO_4 \cdot 12H_2O$. The use of the revised equilibrium diagram for the explanation of the reactions of sulfate solutions with pozzolans containing hydraulic binders is particularly illustrated. The role of activated alumina in zeolitic weathering minerals of pozzolanic and related rock types is emphasized for the correct interpretation of such reactions.

TENSILE SPLITTING TEST AND HIGH STRENGTH CONCRETE TEST CYLINDERS...53-38

Price 35 cents.

SVEN THAULOW—Jan. 1957, pp. 699-706

This paper describes an indirect tensile test for determination of tensile splitting strength of concrete and a Norwegian method for preparing cylindrical specimens in which sufficient compaction of the concrete is secured, and capping for compression test is eliminated. This method of making cylinders is particularly valuable for high strength concretes, where thickness and quality of the capping material may have considerably more effect on the compressive strength test results than for lower strength concretes.

PROPOSED RECOMMENDED PRACTICE FOR DESIGN OF CONCRETE PAVEMENTS..53-39

Price 75 cents.

ACI COMMITTEE 325—Feb. 1957, pp. 717-750

Recommendations are presented for the design of rigid concrete pavements and bases based on practice proved successful in the United States. It offers comprehensive directions to design rigid airport and highway pavements or bases for conditions of climate, traffic, available construction materials and equipment, and construction methods of the United States. It includes recommendations for soil foundations, selection of slab dimensions, joints, and details, for reinforced or nonreinforced pavement. Recommendations for design of cement-stabilized bases, continuously reinforced pavement, prestressed pavement, and rigid resurfacings are not included since their use has not yet developed a generally applicable practice. Design practices of all principal state and federal agencies concerned with paving have been reviewed and related within the limits recommended.

SIX STORIES OF PRESTRESSED SLABS ERECTED BY LIFT-SLAB METHOD.....53-40

Price 50 cents.

JAMES S. MINGES and DONALD S. WILD—Feb. 1957, pp. 751-768

Describes construction of a five-story hospital with solarium. Lift slabs are 43 ft x 182 ft x 8½ in. for the first five floors, and 41 ft x 80 ft x 8½ in. for the solarium roof which was

lifted 62 ft. Special shear blocks made it possible to hold the slab in its lifted position with 1¾ in. pins during welding. This freed lifting equipment to proceed with the next slab. Columns were 14-in. wide flange sections erected in two parts. Top slabs were lifted to the top of the first section and held temporarily while bottom floors were set in final position. While bottom floors were being welded, the top section of the columns was erected and the top slabs placed in final position.

SHRINKAGE AND TEMPERATURE STRESSES IN MASONRY.....53-41

Price 50 cents.

R. E. COPELAND—Feb. 1957, pp. 769-780

Various methods, including crack control joints, have been proposed for crack control in concrete masonry walls due to shrinkage and temperature stresses. This paper outlines a theory based on experimental studies and experience for determining the maximum permissible distance between control joints in blank walls containing no "stress raisers." The effect of variables such as type and degree of restraint and properties of the masonry units is discussed.

The theory is offered not as a rigorous mathematical treatment of the problem but as an approximate guide for the design engineer and architect.

SOME FACTORS INFLUENCING SHRINKAGE OF CONCRETE PAVEMENTS...53-42

Price 50 cents.

F. N. HVEEM and BAILEY TREMPER—Feb. 1957, pp. 781-790

Portland cement concrete pavements tend to become rougher with time. To a degree the development of roughness is initiated by curling of the ends of the slabs. In California, at least, slabs curl upward more than downward because shrinkage due to drying is more pronounced in the upper part of the slab. When curled upward, the slabs are not supported uniformly by the subgrade and the ends deflect more under load. Under heavy traffic, cracks and faulting develop and the pavement becomes progressively rougher. The integrity and smoothness of the pavement can be prolonged if the characteristic shrinkage of concrete can be reduced.

Both portland cement and aggregates affect the amount of shrinkage. Some of the factors contributing to the influence of portland cement are known, although not adequately restricted in standard specifications. The contribution of clay in aggregates to shrinkage has not received the attention it warrants and national specifications do not guard adequately against excessive amounts of clay.

The California Division of Highways has developed simple, short field tests that evaluate both the quantity and activity of clay contained in aggregates. These are known as the "sand equivalent" and "sedimentation" tests. Data are presented to show that a high degree of correlation exists between the results of these tests and the drying shrinkage of mortar and concrete. With suitable specification limits, these tests are effective in securing important reductions in drying shrinkage.

STUDY OF SHRINKAGE IN CONCRETE FRAMES.....53-43

Price 35 cents.

MORGAN B. KLOCK and ROBERT R. SHERIDAN—Feb. 1957, pp. 791-796

During the planning for a building at the Kodak Park Works in 1939, the question of whether to build the frame in two sections with a contraction joint was thoroughly explored. The total length was to be 275 ft, without a joint it would be one of the longest continuous frames in Kodak's Rochester plants. It was decided to construct the building as one unit and to undertake a study of shrinkage in the frame.

Carlson electric strain meters were buried in the concrete in several locations in four slabs, horizontally and vertically. These have provided most of the data which now make up a 16-year record. Drying shrinkage in the order of 500 millionths horizontally and 1000 millionths vertically has been indicated.

PLASTIC SHRINKAGE.....53-44

Price 35 cents.

WILLIAM LERCH—Feb. 1957, pp. 797-802

Plastic shrinkage and plastic shrinkage cracking sometimes occur in the exposed surface of freshly-placed concrete. This shrinkage and cracking is caused by a rapid evaporation of water from the surface of the concrete. Conditions that determine the rate of evaporation are described. Construction procedures and practices that can minimize the causes of this type of shrinkage and cracking are recommended. Specific cases cited show how application of these procedures has solved the problem. It is believed that the recommended corrective measures will solve the problem of plastic shrinkage and plastic shrinkage cracking on construction projects.

DETERMINATION OF CREEP STRAIN OF CONCRETE UNDER SUSTAINED COMPRESSIVE STRESS.....53-45

Price 35 cents.

F. EUGENE SEAMAN—Feb. 1957, pp. 803-810

Presents the many problems involved in the measurement of creep strain in concrete as distinguished from elastic strain and other volume change factors. Describes equipment and procedures developed for the mass accumulation of reliable data necessary to evaluate the variables in concrete. Limited data indicate that curing method may greatly influence the creep strain property of concrete. Creep strain ratio values, for various concrete stresses, are plotted against time for maximum creep-time curve.

GUIDE FOR PAINTING CONCRETE.....53-46
(For paints other than portland cement paint)

Price 60 cents (in special covers).

ACI COMMITTEE 616—Mar. 1957, pp. 817-832

This report describes types of paints, other than portland cement paint, commonly used on concrete. It reviews procedures for preparing the surface, selecting and applying the paint, and for repainting. Dampproofing and waterproofing are discussed briefly. A list of federal specifications for paints suitable for concrete is included.

SHEAR STRENGTH OF REINFORCED CONCRETE FRAME MEMBERS WITHOUT WEB REINFORCEMENT.....53-47

Price 75 cents.

JO DEAN MORROW and I. M. VIEST—Mar. 1957, pp. 833-870

Experimental and analytical studies reported in this paper have shown conclusively that the strength of a reinforced concrete frame member without web reinforcement is affected by shear through the formation of diagonal tension cracks. If the percentage of longitudinal reinforcement is small or the shear span is very long, a member without web reinforcement fails in flexure without prior formation of diagonal tension cracks; in such case, strength of the member is unaffected by shear. If, however, a diagonal tension crack forms, the strength of the beam is usually lower than that corresponding to flexural failure. Depending on its make-up, such member may fail either simultaneously with the formation of the diagonal tension crack or it may fail at a higher load. The first type of failure is designated as diagonal tension failure; the second is designated as shear compression failure. The relationship between flexural, diagonal tension, and shear compression failures is discussed in detail in this paper.

The tests included 33 knee frames subjected to combination of axial compression, shear, and moment, and 38 stub beams subjected to moment and shear. In all knee frames

the axial load was equal to the external shear. The major variables were the length of shear span, the strength of concrete, and the percentage of reinforcement.
Analytical expressions are presented for predicting the diagonal tension cracking load and shear compressior strength. The diagonal tension cracking load is expressed in terms of the nominal shearing stress, and the shear compression strength is expressed in terms of the shear moment capacity.

STRUCTURAL REFRACTORY CONCRETE....53-48

Price 50 cents.

HERMAN G. PROTZE—Mar. 1957, pp. 871-887

Theoretical and practical problems in the construction of jet engine test cell exhaust structures are considered, including the development and use of proper materials, mixtures, equipment, and methods for installation of durable structural refractory lightweight aluminous cement concretes. The author draws from laboratory and field experiences on four projects in recommending current optimum techniques for such work.

DESIGN OF FLOATING SLAB FOUNDATION.....53-49

Price 50 cents.

NORMAN B. GREEN—Mar. 1957, pp. 889-898

A method is developed for the stress analysis and design of a floating or monolithic type of slab foundation that supports edge loads. The method is applied to the foundation of a typical one-story wood frame school building. This type of foundation effects a considerable saving in cost over conventional concrete wall footings with a separate floor slab.

RESPONSIBILITIES OF AN INSPECTOR.....53-50

Price 35 cents.

GRANT BLOODGOOD and LEWIS H. TUTHILL—Mar. 1957, pp. 899-904

Describes general principles, attitudes, and approaches appropriate for any inspector, on any size or kind of job. Place of the inspector in the construction engineer's organization is discussed with emphasis on cooperation with fellow inspectors, and the inspector's responsibility to carry out general organization policy whether it agrees with his personal judgment or not. How to maintain friendliness without familiarity keynotes section on relationship of inspector to contractor. Third section deals with direction of the activities of other inspectors.

REVIEW OF ACTIVITIES DURING 1956.....53-51

Price 35 cents.

FRANK KEREKES—Apr. 1957, pp. 913-916

A net gain of 1057 Institute members is reported for 1956. New publications issued during the year are cited, along with expanded JOURNAL publication schedule and revised scheme for publishing discussion of papers and reports. Work of the Standards Committee is reviewed, and new technical committees are described. Progress in planning and financing the proposed ACI headquarters building is summarized.

PROPOSED REVISION OF SPECIFICATIONS FOR CONCRETE PAVEMENTS AND CONCRETE BASES.....53-52

Price 60 cents.

ACI COMMITTEE 617—Apr. 1957, pp. 917-946

Specifications apply to construction of portland cement concrete pavements and bases under normal conditions for both highways and airports. Standards and specifications of several other organizations are incorporated by reference.
Sources and acceptance standards for materials are given, as well as materials testing procedures and procedures for test of concrete strength to be used as a basis for proportioning of mixtures. Specifications for the materials and construction of soil foundations for concrete pavements and concrete bases are included. Provision is made for use of foundations stabilized by a cementing agent, but materials and construction of such are beyond scope of this specification.
Materials, dimensions, setting, and removal of forms are treated. Construction methods are specified for forming joints, installation of joint seal and load transfer devices, and placing of reinforcement. Concrete proportioning based on design for minimum strength is covered in detail, proportioning based on fixed cement content is allowed. Other sections cover production of high-early-strength concrete and the handling and mixing of materials. Detailed requirements are given for placing, finishing, and curing of pavement concrete. Check of thickness of finished pavement is cited as basis for adjustments in payment to contractor. Protection of finished pavement, opening it to traffic, and public use of thoroughfare during construction are also specified

TESTS OF A NEW METHOD FOR EVALUATING VOLUME CHANGES OF CONCRETE MASONRY UNITS.....53-53

Price 50 cents.

M. W. FERGUSON, G. L. KALOUSEK, and C. W. SMITH—Apr. 1957, pp. 947-960

A suggested procedure developed by ACI Committee 716 for the accelerated testing of autoclaved concrete block for volume change (by drying previously saturated block at 225 F) has certain limitations if used for testing block cured by different methods. Reversing the procedure of the suggested method, first drying and *then* saturating the block, yielded results which appeared to cut total time of test nearly 1 day. Autoclaved block re-expanded to equilibrium length in about 4 hr of immersion, whereas the low-pressure steam-cured units continue to expand, often for prolonged periods of time. The new method, therefore, also appears promising for differentiating between block cured by different methods.

ELASTIC DESIGN OF PRESTRESSED SECTIONS IN FLEXURE BY CHARTS OR TABLES.....53-54

Price 50 cents.

WITOLD W. ZAWILSKI—Apr. 1957, pp. 961-988

A method is presented for direct proportioning of the economical shape of cross section; trial and error effort is eliminated, and cross sections need not be modified. Principal concept of design is based on three simultaneous equations in three unknowns expressing loading and stressing conditions. The general equations presented are applicable to any kind of problem.
A rapid design is demonstrated by using charts or tables exemplifying the practical solution of such equations. The charts and tables are based on two fundamental principles of economical design: full utilization of concrete stresses, and full utilization of the lever arm of the internal resisting couple. Accordingly, two types of charts and tables are compiled: (a) for economical use of concrete, and (b for economical use of steel.
Finally, an economical design by charts and tables is developed for composite cross sections, particularly as applied to bridge decks.

EFFECT OF THE SPECIFIC SURFACE OF AGGREGATES ON CONSISTENCY OF CONCRETE.....53-55

Price 50 cents.

B. G. SINGH—Apr. 1957, pp. 989-998

The specific surface of aggregate for concrete was measured by the water permeability method, and its effect on the consistency of concrete was examined. A

wide range of gradings, including extreme gap-gradings, was tested. The range of mix proportions and aggregate normally used in practice was included.
Results show that the specific surface affects the consistency markedly. Aggregate gradings of the same specific surface, for practical purposes, have the same concrete making properties. However, as the specific surface of the aggregate increases, consistency becomes stiffer, other factors being equal.

ANALYSIS OF CONTINUOUS ARCHES ON FLEXIBLE PIERS.....53-56

Price 50 cents.

WALTER E. RILEY—Apr. 1957, pp. 999-1012

Paper demonstrates the applicability of the moment-distribution method when combined with principles of superposition to the practical analysis of continuous symmetrical arches on flexible piers. The calculations are simple, and all operations of multiplication and division may usually be performed with sufficient accuracy on a 10-in. slide rule.

HOT WEATHER CONCRETING PROBLEMS..53-57

Price 35 cents.

ACI COMMITTEE 605—May 1957, pp. 1025-1032

This progress report discusses the subject matter which is proposed for inclusion in a recommended practice now being drafted by the committee. It discusses, briefly, effects of concreting in hot weather, factors in minimizing hot weather difficulties, keeping concrete temperature down by controlling the temperature of its ingredients, production and delivery, placement and protection, and concrete testing in hot weather.

TABLES FOR CIRCULARLY CURVED HORIZONTAL BEAMS WITH SYMMETRICAL UNIFORM LOADS.....53-58

Price 35 cents.

MARTIN SCHULZ and MAURICIO CHEDRAUI—May 1957, pp. 1033-1040

These tables will simplify and expedite the engineer's task of calculating circular beams without developing the formulas. Step-by-step derivation of the tables is given.

MORTAR- AND CONCRETE-MAKING PROPERTIES OF NATURAL SANDS RELATED TO THEIR PHYSICAL ATTRIBUTES.53-59

Price 50 cents.

C. F. ZIETSMAN—May 1957, pp. 1041-1056

Methods for determining mean particle size (fineness modulus), particle size distribution, particle shape, and solid content of natural sands are presented. It is shown how these properties relate to the water requirements of mortars and concretes proportioned by a recognized system.
Using ¾-in. and 1-in. crushed stone as coarse aggregate and proportioning by ACI's recommended practice for proportioning of concrete mixes, at a constant water-cement ratio, it was found that water requirements to produce concrete of a given slump could be predicted to 95 percent accuracy for 95 percent of the sands used in the experiments.

AN IDEA FOR LONG-SPAN PRESTRESSED CONCRETE BRIDGES.....53-60

Price 50 cents.

E. VAN WALSUM—May 1957, pp. 1057-1066

An imaginative solution applies prestressing to hyperboloidical and hyperbolic paraboloidical girders for long-span bridges. Problem is treated in a general, nonmathematical form.

DIAGONAL TENSION STRENGTH OF REINFORCED CONCRETE T-BEAMS WITH VARYING SHEAR SPAN.....53-61

Price 50 cents.

A. F. AL-ALUSI—May 1957, pp. 1067-1077

A study of the influence of variations of shear span and percentage of longitudinal steel on mode of failure, cracking strength, and ultimate strength of reinforced concrete T-beams without web reinforcement is reported. Emphasis was placed on beams with large shear spans. The 25 beams tested included only simple-span beams under two symmetrical concentrated loads. The influence of mesh reinforcement in the flange, and that of longitudinal compression reinforcement was also investigated. For a shear span ratio (a/d) between 4.0 and 8.0, the ratios v_u/f_c', ultimate shearing stress to cylinder strength, and v_{cr}/f_c', cracking shearing stress to cylinder strength, were for all practical purposes constant. For the same a/d range, a large increase in the steel area did not affect either the ultimate shearing strength or the cracking strength.

FORM CONSTRUCTION PRACTICES.....53-62

Price 50 cents.

SUBCOMMITTEE II, ACI COMMITTEE 622—June 1957, pp. 1105-1118

Subcommittee II, ACI Committee 622 reports on existing practice in construction, design, and use of forms, based on replies to a questionnaire submitted to a selected group of contractors in the United States and Canada. Areas are noted in which contractor efficiency may be improved; architect- or engineer-contractor relationships are treated. Appendix gives detailed summary of answers to questionnaire.

PLASTIC HINGING AT THE INTERSECTION OF BEAMS AND COLUMNS.53-63

Price 50 cents.

G. C. ERNST—June 1957, pp. 1119-1144

Principal object of investigation was to determine the amount of concentrated plastic rotation developed at the connection between beams and columns. Thirty-three tests were conducted, some at a slow loading rate, some at a fast loading rate equivalent to that prescribed for concrete cylinders. Steel ratios of 0.01, 0.03 and 0.05, column widths of 6, 12, 18, 24, and 36 in., and nominal concrete strengths of 3000 and 4000 psi were used.
Concentrated plastic rotation at concrete crushing and at maximum moment is markedly reduced when the steel ratio exceeds 0.01, and is also less for a fast loading rate. Theoretical moments agreed satisfactorily with experimentally determined moments in all cases. At concrete crushing for the 0.05 steel ratio under fast loading, concentrated plastic rotation was virtually negligible. It seems necessary, therefore, to consider the effect of steel ratio and rate of loading in cases for which the ultimate capacity of a structure is dependent upon a redistribution of moment produced by concentrated plastic rotations.

MASS CONCRETE CONTROL IN DETROIT DAM.....53-64

Price 50 cents.

ROY R. CLARK—June 1957, pp. 1145-1168

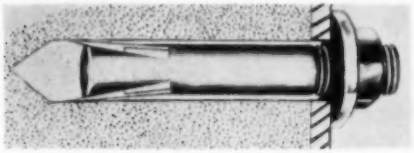
Planning temperature control procedures for the mass concrete of Detroit Dam in western Oregon is explained in detail. Construction methods, including cooling practices, are given, along with cement types and proportioning of concrete. Temperature history of the mass concrete supplements the analysis of temperature strains in each of four zones of the dam.
Uniformly stable conditions were established at the base of the dam, and inspection 3 years after completion disclosed no defects on the outside surface, and only a few hairline cracks on exposed interior surfaces. Total cost of cooling measures was $0.63 per cu yd, about 4 percent of the total cost of mass concrete.

Tools, Materials, Services

Under this heading note is made of producer literature and products of presumed technical interest to ACI users of tools, equipment, materials, accessories, and special services.

Expansion bolt

Eliminating the need of variable bolt length is a self-contained expansion bolt for use in masonry and steel. Rustproof bolt expands when nut is tightened for secure, nonslip grip. Smaller holes are necessary



for the "Wedjin Ankr" since they are drilled through the work the same size as the bolt, taking less time to drill.—World Expansion Bolt Corp., 175 Fifth Ave., New York 10, N. Y.

Mobile laboratory

Mounted on a four-wheel drive truck, complete mobile testing laboratory has van with inside dimensions of 16 x 7 ft. Four engineers and testing technicians can work comfortably in laboratory. Mobile unit carries its own water supply, laboratory sinks, air compressor, air conditioner, vacuum pump, and similar utility equipment. Power is supplied by an electric generating set which has sufficient capacity to light the laboratory and to operate all of the test apparatus such as ovens, sieve shakers, heating plates, mixers, and the utility equipment. Test equipment includes portable 200,000-lb capacity concrete testing machine for 6 x 12-in. cylinder tests. Mobile laboratory is designed for both off-road or on-road use. While unit is in transit, all test apparatus is stowed in special cushioned compartments in drawers and cabinets.—Soiltest, Inc., 4711 W. North Ave., Chicago 39, Ill.

Concrete form panels

A concrete form method to eliminate conventional studs and walers consists of 1⅛ in. exterior type fir plywood, pre-drilled and prefitted with special, rust-resistant fastener hardware. Panels are fitted with anchor nuts and edge-routed for form tie insert. Ties have a safe load of 5000 lb. Anchor nut is counterbored into plywood so there is no protruding surface hardware until the panels are assembled. The formed, nonwarp steel clamps which hold the panels together and are used in place of walers are quickly attached to the plywood at the job site by means of a cap bolt which screws into the anchor nut.—Form Co., Inc., Rockford Trust Bldg., Rockford, Ill.

Soil-cement booklets

Revised editions of "Soil-Cement Construction Handbook" and "PCA Soil Primer" have been published. The booklets include new information based on recent research in soil science and soil-cement construction methods. The construction handbook gives practical, detailed procedures for building a soil-cement base

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course under various soil and topographical conditions. Procedures are based on more than 20 years of experience in construction of many millions of square yards of soil-cement roads, streets, airports, and parking areas. It also gives inspection and field control data and a resume of soil surveying, sampling, and laboratory testing.

The primer contains basic information on soil and its influence on the design, construction, and performance of pavements. It serves as introduction to soil science for highway engineers, presenting in concise form the substance of the most important treatises on soil science as related to pavement. Single copies of these two booklets are available free in the United States and Canada.—Portland Cement Association, 33 W. Grand Ave., Chicago 10, Ill.

Release agent

A formula for concrete block industry said to prevent any adhesion or sticking of cinder and concrete block to metal pallets has been developed. When added to required amount of water, release agent "787" becomes a free-flowing liquid which will leave an anti-adhesive film on metal surfaces.—Pentone Co., Box JACI-257, Tenafly, N. J.

Prestressed concrete leaflet

An 8-page brochure, describing advantages of prestressed concrete structural products' method of making and installing some with the leap double tee is now available. Catalog includes three full "table of loading" pages for roof and floor members.—Leap Concrete Inc., P. O. Box 1053, Dept. 2, Lakeland, Fla.

Film on reinforcement

Prints of a film, "Reinforced for Life" are available on a loan basis. The movie relates in sound and color the Clinton welded wire fabric reinforcement story, showing manufacture of the basic steel and steel wire through to the finished product. The film shows how welded wire fabric was used in the construction of the country's largest self-supporting roof, the part it played in construction of the largest water syphon in America, and in the building of the Gila Canal in Arizona. The film, produced for Colorado Fuel and Iron Corp., runs 20 min.—Thomas J. Barbre Productions, 2130 S. Bellaire St., Denver 22, Colo.

Forms for precast slabs

A bulletin describing inexpensive forms for precision manufacturing of precast concrete double-tee slabs has been issued.—Irvington Form and Tank Corp., 20 Vesey St., New York 7, N. Y.

Swivel nozzle

A swivel nozzle, designed to augment the rapid pneumatic loading of Airslide cars, bulk vans, and "truck-a-bins" has been announced. The nozzle consists of a bent aluminum tube approximately 2 ft long and 3 in. in diameter, fitted into the center of a standard or custom designed aluminum hatch cover. Equipped with a rubber gasket, the hatch cover, when fitted to the hatch, provides an air-tight seal, preventing the escape of bulk material being loaded into the transport unit.—Fuller Co., Catasauqua, Pa.

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DISCUSSION, PROCEEDINGS V. 53

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